The Cotton Gin and Oil Mill

PRESS

DECEMBER 29, 1956

57th year

THE MAGAZINE OF THE COTTON GINNING AND OILSEED PROCESSING INDUSTRIES

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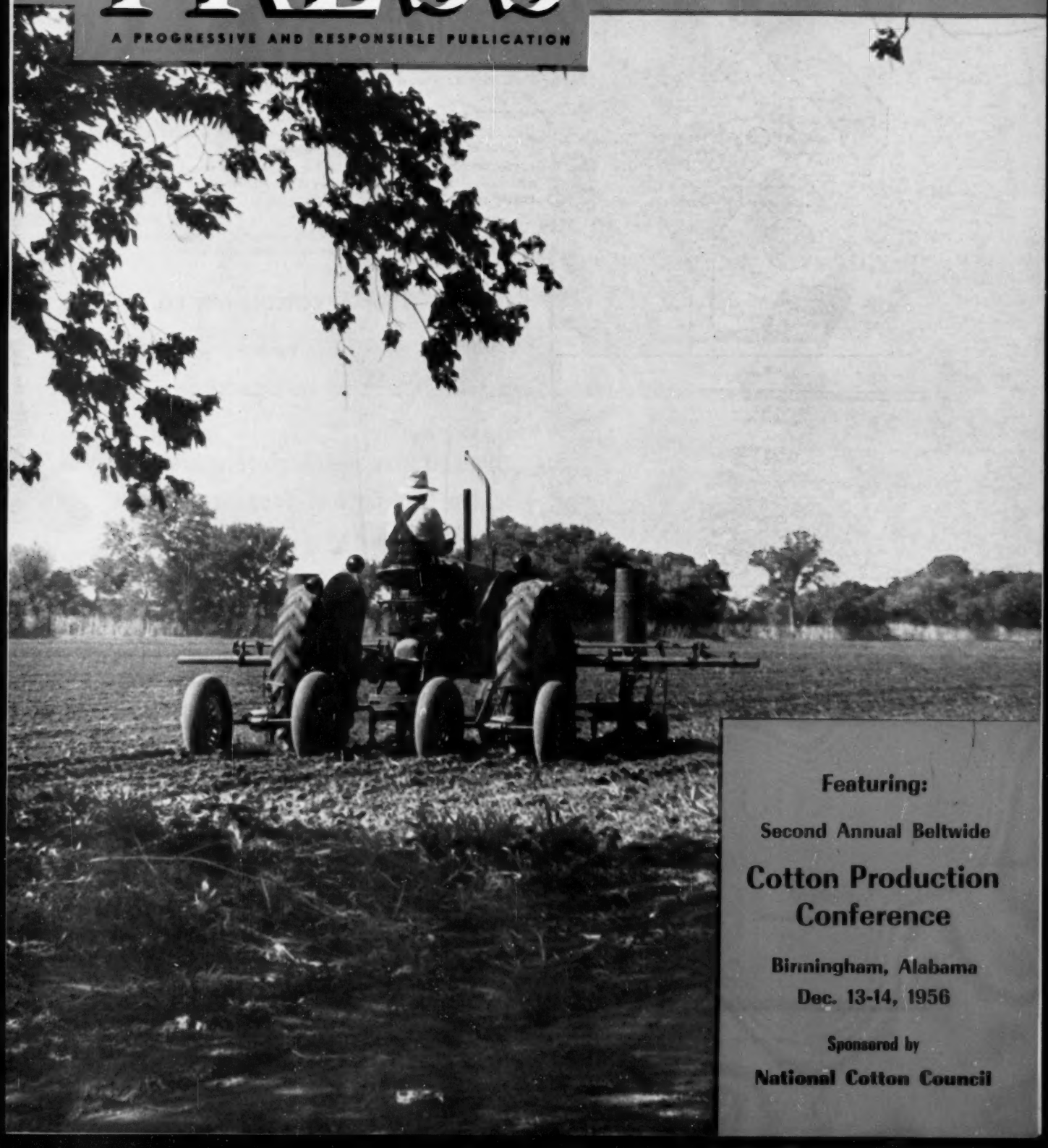


Featuring:

Second Annual Beltwide

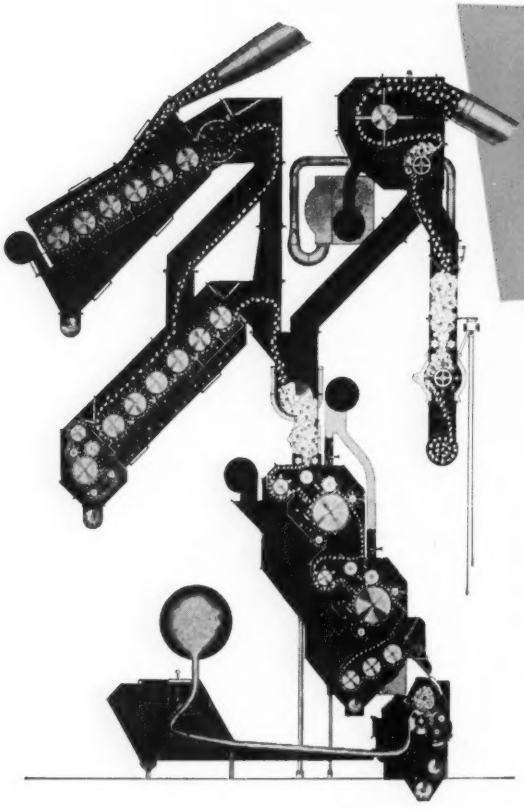
Cotton Production Conference

Birmingham, Alabama

Dec. 13-14, 1956

Sponsored by

National Cotton Council



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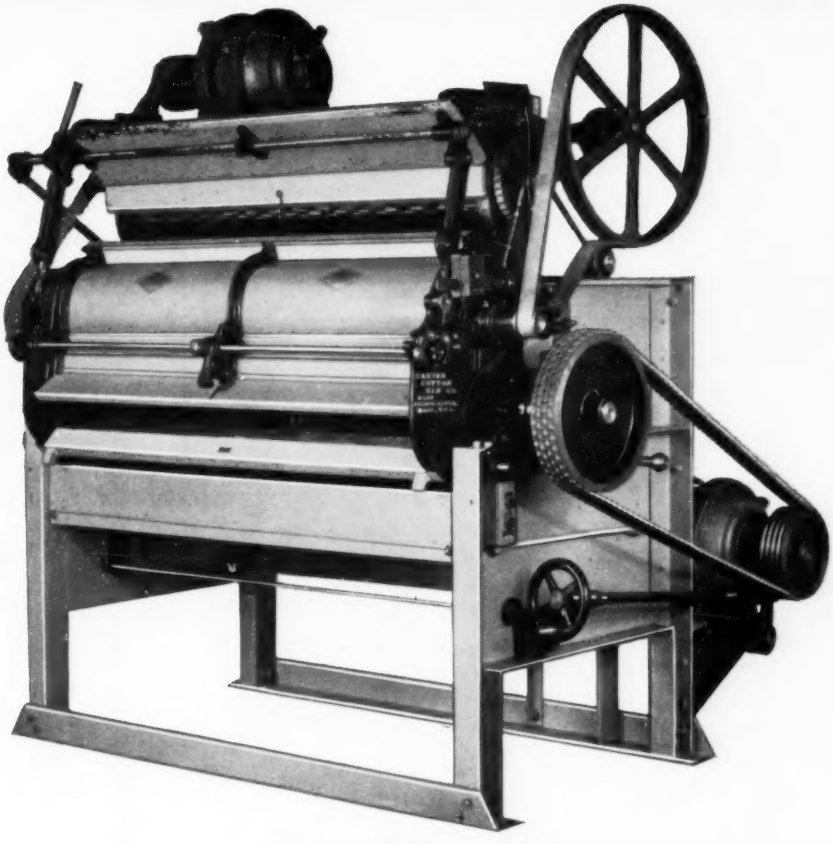

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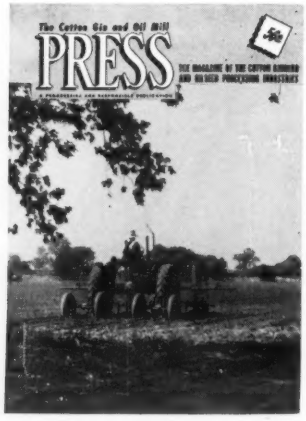

ON OUR COVER:

As the New Year opens, it's almost time to start planting another cotton crop in the southernmost tip of the U.S. Cotton Belt. Our cover scene was chosen with this fact in mind; and, also, because this issue of The Press brings to our readers all of the authentic information on cotton production contained in the report of the second annual Belt-wide Cotton Production Conference, sponsored by the National Cotton Council and many other cooperating organizations.

Photo by John Jeter

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The Cotton Gin and Oil Mill PRESS...

READ BY COTTON GINNERS, COTTONSEED CRUSHERS AND OTHER OILSEED PROCESSORS FROM CALIFORNIA TO THE CAROLINAS

★ ★ ★

OFFICIAL MAGAZINE OF:

National Cottonseed Products Association

National Cotton Ginners' Association

Alabama Cotton Ginners' Association

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OPENING of the second annual Beltwide Cotton Production Conference, Dec. 13, at Birmingham is shown here. At the speakers' table, left to right, are: J. D. Hays, Huntsville, Ala., general chairman of the Conference and vice-president, Alabama Farm Bureau Federation; Dr. E. V. Smith, Alabama Polytechnic Institute, Auburn, who delivered the welcome address; and Dr. Louis E. Hawkins, Oklahoma Experiment Station, Stillwater, and Dr. Byron T. Shaw, USDA Agricultural Research Service, who addressed the opening session. Some 800 persons attended the sessions.

Second Annual Conference on Cotton Production Held in Birmingham

Research is helping producers increase efficiency and reduce costs, leaders say at meeting on Dec. 13-14, sponsored by the National Cotton Council and many cooperating organizations.

COTTON'S GREAT NEED for more research to chart the way for quality improvement and cost reduction was stressed by leaders on the program of the second annual Cotton Production Conference. The Conference was held Dec. 13-14 at the Dinkler-Tutwiler Hotel in Birmingham, and was attended by about 800 persons.

Sponsors of the meeting are the National Cotton Council, land-grant colleges, USDA, farm organizations, vocational agriculture, the agricultural chemical industry and other groups.

This issue of The Cotton Gin and Oil Mill Press contains summaries of Conference addresses, and the Council will distribute the summary-proceedings to those who attended.

General sessions on Thursday and Friday were preceded by technical committee meetings dealing with such topics as insect control, defoliation, cotton breeding, diseases and others.

• **Hays Sets Pattern** — J. D. Hays, cotton producer of Huntsville, Ala., and vice-president of Alabama Farm Bureau Federation, was general chairman for the meeting. He set the stage for later speakers when he said, in his opening remarks:

"We're here to find ways and means of getting the **cost** of growing a bale of cotton **down**, and the **quality** of that bale **up**."

Hays estimated that the cost of producing a bale of cotton would be more than 7.5 cents higher than it is today if we still needed the same number of man hours per bale as were required 10 years ago.

Encouraging as progress has been, said Hays, "its rate is not fast enough for the future.

"We desperately need to speed up accomplishments toward lower costs and better quality . . . toward increasing incomes of those who produce and handle cotton . . . and toward strengthening cotton's competitive position. If during this Conference we can help point the way toward accomplishing these things, then we and the Conference will have served a very useful purpose indeed."

• **Welcomed by Smith**—Dr. E. V. Smith, Alabama Polytechnic Institute dean and director of Alabama Experiment Station, welcomed the vistors.

Doctor Smith brought out the role that the small farmer plays in the cotton industry in the Southeast, and reminded the audience of the need for taking this into consideration in research and planning.

Summaries of addresses by other speakers follow:

Production Research and Cotton's Future

DR. LOUIS E. HAWKINS, Director, Oklahoma Experiment Station, Stillwater.

Research in the area of cotton production and harvesting over the past 25 years has saved about one-third of cotton's present market. Rayon, cotton's most pressing competitor, now takes one-fourth of the combined cotton and rayon market. Without research aimed at reducing the cost of cotton at the mill door, rayon would surely have taken over at least another one-fourth of the market.

Now let's think about what would have happened to the grower without research. Let's say he gets 30 cents a pound for his baled cotton. Added costs of a nickel thereafter deliver it to the mill door for 35 cents. It cost the grower 20 cents a pound to grow, harvest and put his cotton through the gin, leaving him 10 cents for his time, trouble and investment.

But suppose the grower's costs were

10 cents per pound greater—and that is conservative indeed against what would face him by way of insects, plant disease, soil erosion, high labor costs and other production handicaps had there been no research to hold his costs down. Where could you add the 10 cents?

If it were added to the selling price, thereby increasing the cost at the mill door by 30 percent, the spinner would turn to other fibers—rayon mostly—and reduce his take of cotton. Rayon would take a much larger share of the fiber market.

On the other hand, if the 10 cents were taken out of the grower's hide his profit would be zero, and you know what would come of that sort of experience. Many growers would quit cotton. Many would quit the land entirely.

So, in looking to the future and to a healthy status for cotton in the market place, we see it is vital to have a price low enough to compete with or undersell the synthetics—and costs low enough for the grower to maintain and improve his net income. Research is the chief answer to both problems.

Let's remember, too, that the quality factor is highly important. Preservation of grade in the fiber has been most difficult with increased mechanization. And it is only through research, and research application that both mechnization and quality preservation can be achieved.

Geneticists and breeders have a big job to do in the years ahead. Because of their outstanding work in the past, few or none of the varieties of 30 years ago continue today in the strains grown then. They have been displaced by new models with higher per acre yields, greater resistance to disease, wider tolerances for unfavorable climatic conditions, better suitability to mechanization and more desirable and useful fiber characteristics. Research must continue, and if possible speed up, this trend toward varietal improvement.

Many of you are aware of the survey and inventory that have been under way for several months to look at the problems that confront cotton, and suggestions of research into the solutions of those problems. Every State Experiment Station director in the Cotton Belt has counselled with members of his staff on this subject. Each of these directors subsequently submitted to a special three-man committee the listing of the problems facing cotton as his staff viewed them and an order of priority as to urgency of those problems. This special committee summarized the responses of the 15 or so station directors and reported back to the directors in their annual meeting.

The Extension folks, likewise, have taken a look at the educational program for the advancement of cotton. Their thinking and plans for future projection of their program and the forward look of an expanded research program are now being readied for integration in the several states.

The research needs as envisioned by the state people are being studied further in cooperation with USDA research personnel. Also, a survey of needs to be met through research has been made in the area of private industry, and this is being tied in with the public agency inventory.

Some of the more critical research needs in cotton production and harvesting, as pointed up by this study, are:

- **1. Breeding:**

a. Improved fiber quality for specified end uses.
b. Resistance to disease and insects.
c. Adaptation of the plant to mechanical harvesting.
d. Hybrid varieties; tetraploids, hexaploids, oc-

1957 Conference Will Be in Memphis

The third annual Beltwide Cotton Production Conference will be held at the Peabody Hotel in Memphis, Dec. 12-13, 1957, the National Cotton Council announces. General sessions on these two days will be preceded by meetings of special groups on Dec. 9-10-11, as has been the practice in previous years. Sponsored by the Council, in cooperation with land-grant colleges, the agricultural chemical industry, USDA, vocational agriculture, farm organizations and other groups, the Conference meets in Memphis every other year. In alternate years, it will be held to the east and to the west of Memphis. Since the 1956 Conference was in Birmingham, a western location, to be named later, will be the site for the 1958 meeting.

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taploids or other "tailor-made" varieties may be produced for specified growing conditions.
e. Low gossypol seed.
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• 2. Physiology:

a. Fruiting habits.
b. Seedling vigor.
c. Nutrient requirements.
d. Defoliation.
e. Growth regulators.
f. Effects of pesticides on fiber characteristics and quality.

• 3. Insect Control:

a. Resistance of insects to insecticides.
b. Use of systemics (seed treatment).
c. Biological control.
d. Screening new chemicals.
e. Methods and time of application.

• 4. Disease Control:

a. Inter-relationships of soil-borne micro-organisms.
b. Host-parasite relationships.
c. Seedling diseases.
d. Genetics of plant pathogens.
e. Nematodes.

• 5. Irrigation:

a. Water requirements at various stages of growth.
b. Relationships to other practices, emphasis on economics.
c. Methods of water application.

• 6. Fertilization:

a. Inter-relation of fertilizer practices and other practices.
b. Methods of application.
c. Relation to other crops in series, especially sod in rotation.
d. Effect on quality (composition) of seed (meal).

• 7. Mechanization:

a. To reduce hand labor; practices and methods.
b. Development of specialized machinery.

• 8. Soil Management:

a. Surveys to determine soils best for cotton.
b. Seedbed preparation.
c. Crop residue management.
d. Hard pans, compacted zones and effects on root penetration.
e. Minimum tillage necessary.
f. Moisture insoak and conservation.
g. Improving upon soil temperature for early planting.

• 9. Mechanical Harvesting:

(Essential to reduction of production costs, but let's leave this to the annual Beltwide Cotton Mechanization Conference.)

• 10. Production Economics:

a. Determination of minimum (and maximum) economic sized units.
b. Opportunities for sub-economic unit operators to move to more remunerative activities.
c. Custom type operation on small units.
d. Cooperatives among small unit operators for purchase of expensive equipment.
e. Upper limits of fertilization, irrigation, insect control and use of capital for maximum net income per acre.
f. Competitive position of cotton with alternative farm enterprises.
g. Pilot farms for applied research and education.

There it is, gentlemen! There, in broad outline, is the job research must do to reduce costs of growing and harvesting cotton—to improve and preserve fiber quality—and to help build the foundation for a big future for our cotton industry.

Integrating Research on Soil-Water-Plant Relationships

DR. BYRON T. SHAW, Administrator, Agricultural Research Service, USDA, Washington.

In cotton—as in other crops—the big payoffs are coming when a number of improved practices are combined. This has been brought into sharp focus, here in the eastern half of the Cotton Belt, with the increasing use of irrigation. Water has become the primary limiting factor in production that uses improved varieties, extensive pest control, and higher rates of fertilization. Growers are turning to irrigation to protect their investments in other good practices.

Two research developments suggest that irrigation can be made a highly efficient practice in cotton production. The first is that cotton—in its productive phase—is less tolerant of drouth than has generally been recognized. The second is that cotton is an easy crop to irrigate. It adapts itself to an abundance of water and to lesser amounts, over a wide range.

• Adequate Return on Investment — There's no question that irrigation has an enormous potential for boosting cotton yields. The important question is how can this be done efficiently so that the grower gets an adequate return on his investment.

It has become evident—throughout the humid region—that the use of irrigation is far more complicated than it seems to the uninitiated. The effect of irrigation on other production practices such as drainage, fertilizers, pest control, and deep tillage creates many new problems. And research doesn't yet have the answer.

Even in the Southwest where cotton has been produced under irrigation for many years, we're not making highly efficient use of water. No more than a third of all the water diverted from streams ever gets into the soil root zone. The rest is lost along the way—from canals and ditches through seepage and evaporation. It's lost in the fields as a result of poor preparation and improper application.

• Deep Tillage—As more growers have turned to irrigation there has been an increasing interest in deep tillage to break up compacted soil. Our research has shown benefits from deep tillage in some soils, no benefits in others. The studies have given excellent results on soils that have become compacted through tillage. Subsoiling has increased yields by an averoge of a half a bale an acre. On sandy soils and in cases where there is a hard clay pan, deep tillage has given no response. It's estimated that from 300,000 to 400,000 acres in the Delta are being deep tilled each year and at least half the land doesn't need it. In this case, producers are simply adding to the cost and getting no return.

• Expanded Research — The only way to forestall these losses and increase efficiency is to move forward in research along a broad front. We want to be able to predict the effects of individual practices as they relate to yield and quality. We want to be able to estimate costs and returns with a high degree of precision.

Let's look for a moment at what this involves. First, it requires an understanding of the influence of typography and weather on production. Along with these, we must consider water resources, soil structure, native fertility, and methods of building up soil productivity. Reliable estimates must take the influence of drainage and irrigation systems into account. They must also consider genetic factors in the crop variety that make it responsive to high rates of fertility and moisture.

Now the point I would emphasize is this. Each of these factors is related to the other. They are inseparable. And while improvements can be made in each of them through specialized study, the big payoffs will come through research that helps us to understand the whole complex.

Let me outline briefly some of the research that must be done before we can advise the grower on the optimim combination of practices to meet his particular situation.

First, we need to determine, under highly controlled conditions, the influence of soil physical conditions—temperature, aeration, and moisture—on the rate and nature of plant growth at various stages.

At the same time, we need to clarify the relationship between soil physical properties and other aspects of the environment such as weather.

For many years, even the soil scientists attributed the supply of soil moisture, available to plants, almost exclusively to properties of the soil. However, research has shown that there are many characteristics of plants and climate involved. The plant is the organizer of the environment in which it is grown. It makes use of the sunshine, the air, and the soil, and it responds to its biological environment—the insects, weeds, and plant diseases.

We need to take a look at the whole process of physiology and nutrition of the cotton plant. Fundamental studies of how nutrients and water move from the soil to the plant root would help explain why the crop takes up only half of the fertilizer that's applied to it.

If the effects of all individual plant-growth factors could be determined at several levels of each of the other factors, perhaps it might be possible to work out a single plant-growth equation.

But we're a long way from that goal. There is no record of a single experiment in which each of the physical and chemical plant-growth factors was even characterized—much less controlled.

• Controlled Growth Chambers — The nearest approach is in the controlled growth chambers that have been developed to study the influence of the day-length cycle on plant growth.

A controlled growth chamber at Auburn is one approach to a problem that's under study across the Cotton Belt—losses from boll shed. As you know, we

Mellorine Approved By Louisiana

Cotton industry representatives have finally secured authorization for the production and sale of mellorine in Louisiana after long opposition from dairy interests. After much work by Louisiana members of the industry, assisted by Carlton H. Power of the National Cotton Council and Dalton E. Gandy of National Cottonseed Products Association, the frozen dessert containing vegetable oil was granted the right to be sold in Louisiana on Dec. 17.

still don't have the fundamental knowledge to draw up guidelines that will help the grower reduce losses from boll shed. The work at Auburn is giving a better understanding of the plant's environmental needs for good boll set.

• **Plant Growth Regulators** — Another scientific advance—new knowledge of plant growth regulators — has been brought to bear on the boll shed problem at Stoneville, Miss. The work at Stoneville shows that boll shedding is actually controlled by auxins, the naturally produced growth regulators.

Findings in these basic studies can have implications for scientists in every field of work concerned with cotton.

For example, if soil pH proved to be related to boll shed, the information would support evidence from other sources that more lime could be used advantageously in the humid half of the Cotton Belt.

• **Plant Nutrients** — A build-up in acidity—both in surface soil and subsoils—is now showing up in many tests. We need research to determine the influence of liming on nutrient balance. And we need to clarify the effects of varying levels of any one nutrient on the plant's requirements for other nutrients.

Speaking of plant nutrients, we'll probably need to develop fertilizers compounded more specifically for the different kinds of soil. Along with these, we need to work out new methods of applying fertilizer. And our techniques for testing soils for fertilizer requirements will need to be improved, particularly in regard to fitting test procedures more closely to the different combinations of soil, management, systems, and crops.

A lot of the envirement that influences efficiency of crop production is below the surface of the ground. This has been brought out strikingly in recent findings on the role of nematodes in cotton production. The relationship of these microscopic pests to Fusarium wilt is well established.

Along with nematodes, we need to give more attention to the soil microorganisms that are beneficial to plant growth. One line of work now in progress seeks to identify microorganisms that may be more effective in soil aggregation.

• **Research Team** — The whole field of soil microorganisms is of enormous interest to science. But there is a shortage of scientists qualified to do the work. They are in great demand by industry as well as by agriculture. In any study of plant-soil-water relationships, the microbiologist is an important member of the team.

And scientists agree that the barriers to advances in our understanding of soil-plant-water relationships will yield only to the team approach.

A fully-manned research team concerned with plant-soil-water relationships in cotton would include the geneticist, the plant physiologist, the plant pathologist. There would be engineers with special knowledge of irrigation, drainage, and tillage. There would be an entomologist, a microbiologist, and a nematologist, if one were available. There would also be a soil chemist and a soil physicist to study the complex relationships of plant growth under varying levels of fertility and moisture.

As the fundamental relationships between soil, plants and water are better understood, other teams of scientists will fit the new information into farming systems. It's at this point that production economists, with other scientists, will work out principles for estimating costs and returns.

I'd like to conclude by suggesting just one possible payoff from the team approach to basic research: The payoff from more efficient use of water. Today, growers are making an average of 125 pounds of seed cotton per inch of water. Experimentally—by judicious use of water at critical stages of growth—we're getting more than 200 pounds of cotton per inch of water. The scientists tell me that if we had a better understanding of the soil-plant-water relationships we could develop combinations of practices that would give 400 pounds of seed cotton per inch of water. In that event, three to five bales to the acre would not be unusual.

Conferees Just Could'nt Quit Conferring

■ **CONFEREES at the 1957 Cotton Production Conference found it difficult to quite conferring. Long after the sessions were officially over and the goodbyes had been said at the Dinkler-Tutwiler headquarters for the meeting, many of those attending were in session at the Birmingham Airport—far more anxious to see their own families than the friends who were stranded with them as they awaited weather-delayed planes. Flights to Memphis, Atlanta, Dallas and other cotton centers ran many hours late, and at least one-tenth of the entire Conference group could be seen at the airport after dark. All, however, were good-natured about the matter; and one group burst into cheers and applause when their stewardess announced that the flight was underway, just eight hours later than scheduled.**

Effect of Environmental Factors on Fiber

DR. THOMAS KERR and DR. W. H. THARP, Physiologists, Agricultural Research Service, USDA, Beltsville, Md.

To help us understand the effects of environment on fiber properties, let's first take a quick look at how fibers develop.

Fibers are single celled hairs of the epidermis of the seed coat. They begin as tubular extensions of the epidermis at the time of flowering, and as the seed grow in size, the fibers grow in length. This extension in length continues for 16-20 days after flowering, by which time the external dimensions of the fiber have been attained. During this period, the fiber consists of a protoplast enclosed only by a thin primary wall.

Thickening of the fiber wall, known as the development of the secondary wall, begins after elongation has ceased. Successive layers of cellulose are deposited on the inner surface of the fiber at the expense of the lumen, continuing for approximately 20-30 days. A few days after this deposition ceases, the boll opens.

Two structural features of the secondary wall influence fiber properties: (1) The pattern of the cellulose and (2) the thickness of the wall.

• **Cellulose Pattern** — The pattern of the cellulose is complicated. Cellulose is composed of long chained molecules which are oriented parallel to each other and in a spiral at an angle of approximately 20-40 degrees to the axis of the fiber. The pattern changes frequently from a left to a right handed spiral and vice versa. These changes are called reversals and there are 50 to 60 of them in a fiber one inch long. Then too, the fiber grows in a cramped position within the locks so that numerous points of kinks or crimps are developed in the fiber wall.

• **Fiber Strength** — Strength of the fibers, as measured by the bundle method, is determined by the pattern of cellulose deposition. For many years we considered that strength was determined chiefly by the spiral angle; that is the angle which the cellulose chains make with the fiber axis and which may be measured from the x-ray diffraction pattern. We know now that this is only part of the picture. The pattern of cellulose deposition along the length of the fiber is not uniform and fiber strength is also influenced by the frequency and intensity of weak places along the length of the fiber. Both factors influencing strength, the spiral angle and the "weak places," vary with environment during the time the pattern is established. And this pattern is determined during the whole period of secondary deposition.

The thickness of the secondary wall is a function of both the rate of cellulose deposition and the time that the wall is deposited. The thickness of the wall is also related to fiber fineness and maturity. Actually, from the standpoint of environment, variations in fineness are related solely to the thickness of the wall. Futhermore, the micronaire measurement of fineness is in reality a measure of both maturity and fineness.

• **Factors Affecting Development**—Now let's consider the influence of environment on the development of the boll and of the fibers in the boll. First let's consider fiber length.

Since length is determined during the first 16 to 20 days of boll development and since bolls may abscise until they are seven to 10 days old, there is less influence of adverse environment on length than on other fiber properties. Nevertheless, the length of fibers may vary as much as 3/16 of an inch within a variety.

The main factor causing a shortening of the length is water stress or drouth. There is little or no evidence to indicate that variations in temperature during the time that the fibers are elongating will influence length.

Both temperature and water stress produce striking effects on the pattern of secondary wall deposition and, therefore, on fiber strength. The higher the temperature, the less is the spiral angle which the cellulose chains make with the axis of the fiber (i.e., the less the x-ray angle) and the higher is the

bundle strength at zero gauge length. This relationship also is reflected at the ⅛ inch gauge length.

So far as water stress is concerned, the greater the stress the less is the x-ray angle and the higher is the strength at zero gauge length. However, under water stress the strength at ⅛ inch gauge length does not increase proportionately with the increase of strength measured at zero gauge length.

The effects of environmental factors on the thickness of the secondary wall, and therefore on fiber fineness, may be best understood if we consider them in terms of ripeness or maturity. Immature fibers are ones which do not undergo full development, and development may cease at any stage.

There are many causes for the failure of bolls to undergo full development. Severe drouth, particularly when combined with hot weather, along with high saline soils, insect punctures of the boll, root diseases such as Verticillium wilt, early frost, potash deficiency and defoliation of the plants with half developed bolls, are all common causes of fiber immaturity.

Some unfavorable conditions strike quickly such as the early use of defoliants or an unexpected frost. At other times, unfavorable conditions are associated with a slow development which prevents the proper maturation of the fruit. This is the case with potash deficiency and it is also found in the slow rate of development of a late crop on the High Plains under low temperature.

So far we have considered the effect of environment on the growing boll. The picture is not complete without knowledge of the changes which take place as the bolls open.

Within the growing bolls fibers are packed in each lock. They resemble elongated cylinders with occasional crimp or kinks. When the seed mature, the seed coat cells, including the fibers, die. Then the bolls crack and, as the fibers lose water, they change, becoming convoluted twisted ribbons when dry.

• **Chemical Changes**—As the fibers dry out for the first time, there are two chemical changes that take place: (1) A rapid loss in the soluble constituents of the fiber, particularly the sugars, (2) the formation of secondary valence forces or hydrogen bonds between the cellulose chains. Once these two changes have occured, the fibers become very much more resistant to chemical action and to microbial activity. However if we are to obtain undamaged fiber, it is important that the period between the cracking of the boll and the fluffing of the cotton proced without delay (i.e., within one to two days). If this does not occur, microbial attack will follow.

Bolls that have cracked will not dry out when the water vapor of the surrounding atmosphere remains high. This may be caused by protracted periods of rain, or, in the bottom crop, by a canopy of leaves which may be the result of thick stands and heavy fertilization. If microbial attack on undried but open bolls is allowed to go to completion, it results in "tight lock" boll rot. This represents a loss in yield but it is not of concern in the quality of cotton in the bale, because such cotton is not harvested.

It is the microbial attack that begins, that develops part way and is then stopped by a delayed drying of the boll, that is important. In this catagory we have the "yellow spot" that is so striking under ultra violet light. Although "yellow spot" is striking and has received considerable publicity, it causes but a fraction of the damage produced by other organisms.

Not all the effects of microorganisms on undried cotton take place between the time of boll opening and initial drying. Similar effects may occur as the result of insect punctures providing a path for the entry of fungi and bacteria into the growing boll. Insect injury in itself may damage a lock or part of a lock, whereas fungal damage coming in through the insect punctures may proceed to adjacant locks. Damage associated with pink boll worm appears to be particularly bad in this respect. In addition to damage associated with insects, bacterial blight can provide its own entry into maturing bolls by means of boll lesions.

The effect of microbial attack on undried cotton results in spots in the bale and masses of damaged cotton. In turn, this damaged lint is associated with degradation of the cellulose. Usually the degradation of the cellulose is localized on the fiber and results in breakage causing a reduction in staple and an excess of short fibers. This means increased mill waste and it is considered to mean increased ends down in processing.

After the bolls have opened and dried, weather may still cause damage to the fiber properties. This type of damage is associated with a change in color of the lint and a loss in grade. It is also caused by microbial activity; however, the microorganisms attack first the non-

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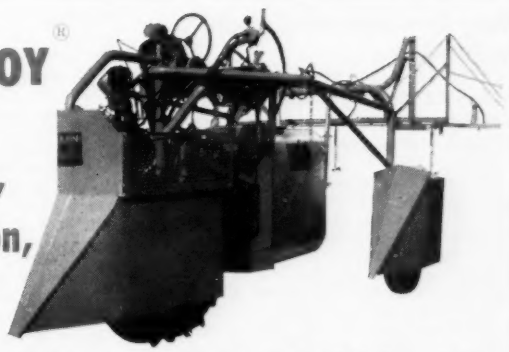

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- LARGER BOLLS WITH MUCH LESS ROTTING OF FIBERS
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cellulosic constituents of the fibers and only with prolonged wet weather is the cellulose structure affected.

Open cotton in the field is also degraded by sunlight. Ultra-violet light affects fiber strength, causes fiber breakage in ginning and therefore, increases the amount of short fibers. There is a loss of approximately one percent in Pressley strength, measured at zero gauge length, per week of exposure. We do not know the effect of the loss of strength at finite gauge length.

From this review it may be seen that the effects of environment are many and they are complex. More research needs to be done to evaluate the effects of environment on fiber properties. This includes further work on the fiber properties themselves, for the better we understand fiber properties, the more we can understand how environment will affect them.

New Concepts in Cotton Fertilization

DR. ROBERT W. PEARSON, Soil Scientist, Agricultural Research Service, USDA, Auburn, Ala.

Nitrogen has always been one of the first limiting factors in cotton production in the rain-grown areas. It was deficient in the virgin soils and does not accumulate from fertilizer applications; so it will continue to be one of the most important fertilization problems.

The most recent figures show that, on the average, only about 26 pounds of N per acre are being used on cotton in the Southeast. The cotton crop must take up about 100 pounds of nitrogen per acre in order to produce the first bale of lint, and each succeeding bale requires at least 30 pounds more. Since the native soil nitrogen is very limited and the recovery of applied nitrogen is always poor—ranging from 25 to perhaps 60 percent—present rates of application must be increased where yields above the bale-per-acre level are expected.

We all know the traditional fear of too much nitrogen on cotton, and without the advantages of improved methods of insect control, defoliants, farm power machinery, etc., there would undoubtedly still be reason to stop at 60 pounds of nitrogen.

Rates actually being used in some sections, for example in the Mississippi Delta, are much higher today than we would have dared recommend a few years ago, and experiments have shown that much higher rates still can be used without serious danger provided other management practices are adjusted accordingly.

Results of many field experiments in this region show that, on the average, there has been little response to nitrogen beyond about 60 pounds per acre. Keep in mind, though, that the yield level even on experimental plots has generally been a bale or less per acre due to myriad other environmental factors — lack of moisture, unfavorable temperature, nematodes, boll weevil, nutrient unbalance, salt damage, toxic substances, and soil acidity, to mention a few. High rates of nitrogen would only be indicated where the total growth conditions can be controlled at least to the extent of raising yield level expectations to two bales or more per acre. Results from experiments at the Delta Branch Station at Stoneville, Miss., show consistent yield increases to 100 or more pounds of nitrogen fertilizer per acre in the better cotton years.

There are now available a number of nitrogen fertilizer materials such as urea, ammonium and nitrate salts and anhydrous ammonia. Research results show that, pound for pound of nitrogen, these materials are about equally effective, provided lime and potash are not limiting factors. The selection of a material should be based primarily on price per unit of nitrogen and the availability of equipment for application.

Use of winter legume cover crops as a source of nitrogen has very limited acceptance among farmers. We should recognize, however, that under proper management the equivalent of 60 to 80 pounds of fertilizer nitrogen can be added to the soil in a legume winter cover crop such as vetch or crimson clover.

• **Lime** — In our preoccupation with making the most effective use of fertilizers, lime has often been neglected. As yield levels are pushed upward and more intensive management practices become standard operating procedure on the farm, soil acidity looms as one of the major limiting factors in cotton production. Recent soil test laboratory summaries in the Southeast have shown that from ⅓ to ½ of the soils are too acid for best growth of cotton without liming. Several recent field experiments have shown yield increases up to 500 pounds of seed cotton for liming, even where the soil was not strongly acid.

The necessary trend toward higher and higher rates of nitrogen fertilizer is one reason why the soil acidity problem is one of growing importance. Many of the commonly used nitrogen sources have a residual acidity when applied to the soil. A 200-pound application of nitrogen in the form of ammonium nitrate, anhydrous ammonia or urea, for example, would require about 400 pounds of limestone to neutralize this acidity. So it is easy to see that repeated applications of fairly high rates of these nitrogen fertilizers, even for a very few years, would seriously aggravate the need for lime that already exists in many of our soils.

There are definite signs that magnesium is becoming deficient in our sandy soils. As general use of mixed fertilizers neutralized with dolomite decreases, this problem may become more serious. Of course, the solution is simple — an adequate liming program based on soil test laboratory recommendations.

As soils become more acid, the supply of available bases, such as calcium and magnesium, decreases. A number of other unfavorable conditions may also develop. One of these is the presence of excessive amounts of soluble manganese in the soil. Cotton grown under these conditions may develop "crinkle leaf," which is apparently due to manganese toxicity and causes reduced yield and even death of the plant in severe cases. The soil condition that causes this trouble can be corrected by the proper use of limestone.

• **Phosphorus** — Phosphorus from fertilizer treatments tends to accumulate in the soil. For this reason, soil phosphorus is not nearly as deficient in the cotton-producing areas of the Southeast as it was originally. This should not be taken to mean, however, that phosphorus can be left out of the fertilizer altogether. Although the yield increases for phosphate fertilizer are considerably lower now, there is seldom an instance reported of no increase, and the advantage of having the crop get off to an early, vigorous start is alone well worth the cost of the average phosphorus application.

The amount of phosphorus that should be used will vary greatly, depending upon the level of accumulated phosphorus from past fertilizer treat-

Mississippians Proud of Boys

MISSISSIPPI Cottonseed Crushers' Association is proud of this 4-H livestock judging team, whose trip to the International Livestock Show in Chicago was sponsored by the crushers. The boys took top honors as a team, and Rodney Henderson had the highest individual score, as well as first place in swine judging. Left to right are C. E. Estess, team coach; Ted Preuss; Peter Balgord; Harvey Lewis; Rodney Henderson and R. M. Lancaster, Extension assistant animal husbandman. The team is from Hinds County; and the photograph was made by Howard Langfitt, leader of the boy's "Pace Setters" 4-H Club and farm editor of WLBT-TV, Jackson, Miss. The Mississippi Association also sponsors dairy judging and junior livestock judging teams.

ments This is where the soil testing service can be a lot of help. The amount of available soil phosphorus shown by an analysis reflects past fertilization and permits making a recommendation that takes advantage of this accumulated reserve.

Phosphate materials are seldom used alone. In the past they were almost universally part of a mixed fertilizer produced by moderate ammoniation of ordinary superphosphate, which resulted in a product having a considerable amount of water soluble phosphorus, perhaps as much as 65 percent, and a relatively large amount of calcium sulfate. The rest of the phosphorus was also present in a relatively available form for plants. Technological advances in the fertilizer industry have resulted in a strong trend in the past few years toward higher levels of ammoniation, using triple super. The product has half or less as much water soluble phosphorus, and the balance of it is theoretically, at least, less readily available to plants. Also, sulfate is generally absent from these mixtures unless it is added purposely. We do not know precisely the extent to which these shifts in phosphate solubility may affect cotton yield, but research is in progress on this question.

• **Potassium**—Intensive cultivation with generally inadequate potash fertilization has depleted the already-limited native soil potassium reserves to the point that deficiencies of this element have often limited cotton yields in the Southeast.

In a few of the finer textured, more fertile soils of the region, potash is seldom required in large amounts. But on the sandy soil, for example, throughout the Coastal Plain, rates up to 60 pounds of K_2O are quite commonly required, and instances of response to higher rates have been reported.

There are definite leaching losses of potassium in the sandy soils, as well as considerable fixation of available potassium to less available form in most soils. This means that we will never build up the potassium level of most cotton soils to a point where we can omit or drastically reduce the amounts of this element in the cotton fertilization program. And this brings up another point that should be mentioned. Lime and potash affect each other's availability to plants in that if both are deficient or even approaching deficiency, and one is added in liberal amounts, it will often cause a serious deficiency of the other one to show up. Since many of our cotton soils are both acid and low in available potash, this interaction should be kept in mind when deciding on fertilization treatments.

• **Sulfur** — In years past, there has been little concern over the possiblity of sulfur deficiencies in cotton because the fertilizers generally contained ample supplies, both from the ammonium sulfate used as the solid nitrogen material and from the ordinary superphosphate. As more and more triple super is used and ammonium nitrate replaces ammonium sulfate, there is reason for us to become concerned with the sulfur requirements of cotton.

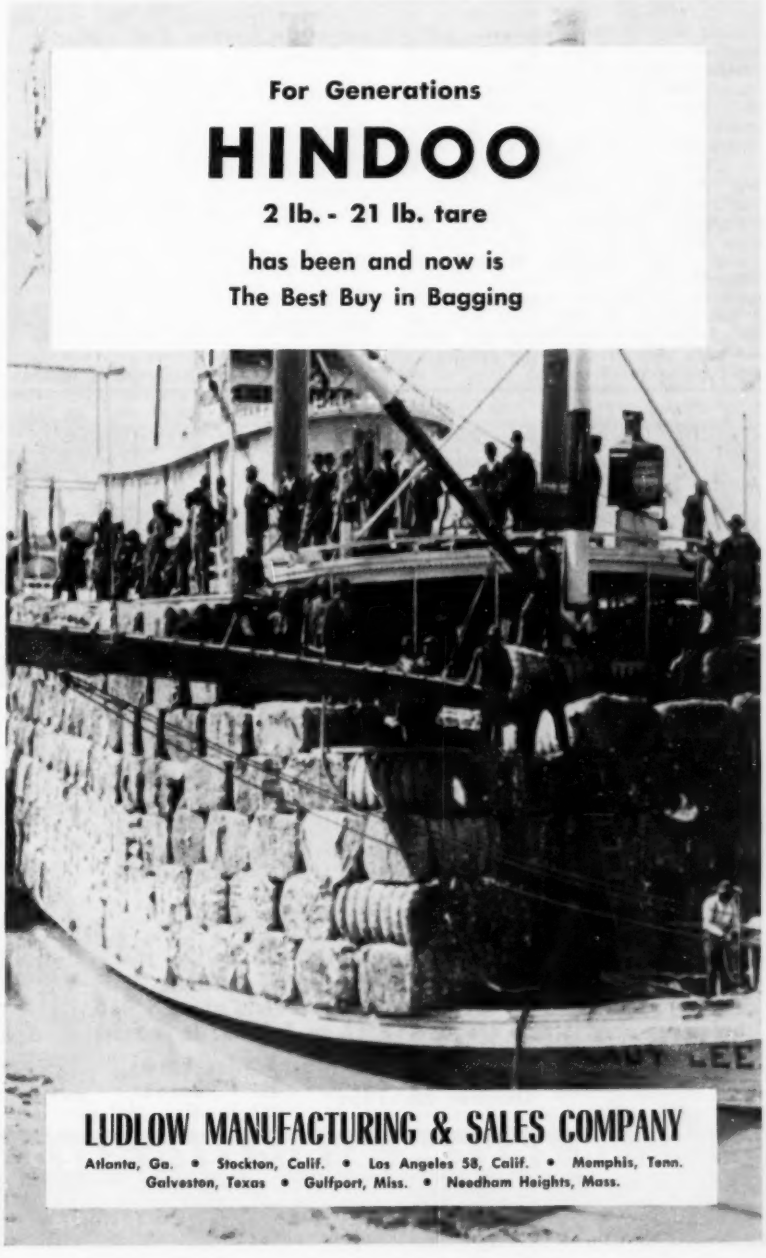
As a result of the increasing importance of this problem, a research project was started in 1951 by the Agricultural Research Service in cooperation with each of the Southern Agricultural Experiment Stations. This joint study has shown so far that the soils throughout the Cotton Belt contain an average of only six pounds of extractable sulfur in the plow layer, although there are accumulations of adsorbed sulfate at a lower depth in most soils.

Outside of fertilizer additions, there is no way for the sulfur content of the soil to be increased except through the small amounts brought down in the rainwater. This has been found to be only six pounds, on the average, per acre annually in the Southeastern cotton area. Repeated cropping using high analysis sulfur-free fertilizers has already shown that serious sulfur deficiency will occur on many of our productive soils within a period of only two or three years. In the regional project, for example, use of sulfur increased seed cotton yields by 100 to 500 pounds in the third year after discontinuing the use of sulfur-containing fertilizers.

The pattern emerging from this most recent study is consistent with findings of earlier short-term experiments, and strongly suggests that fertilizers to be used with cotton in the South should contain a minimum of eight pounds of sulfur in a soluble salt form.

• **Minor Elements** — The cotton plant seems to be able to satify its minor element needs even under conditions of very low soil supply. There have been reports of response of cotton to boron both in Mississippi and South Carolina, but minor elements are not considered a problem at present by most soil scientists.

• **Placement** — Principles of fertilizer placement for cotton have been known for years, and are still perfectly sound,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qualitatively, for the solid materials. Loss of stand and yield reduction have invariably followed when the fertilizer has been placed either in contact with or directly below the seed, even at several inches below the seed. Best placement has been in bands to the side and below the seed.

In spite of the fact that we have recognized the ill and known the cure for years. cotton yields are still being cut on many fields by improper placement. And the danger increases sharply as rates of fertilizer go up. As we have already noted, potash and nitrogen should be increased relative to phosphorus in most areas. They are the materials that cause salt damage, and the damage is greatest in sandy soils where generally the need is greatest for higher rates—a sort of self-aggravating problem. It seems likely in retrospect that much of the advantage for side-dressing application of nitrogen over application at planting may in fact have been due to reduction of salt injury as much as to increased efficiency of nitrogen utilization, at least in medium to fine textured soils. This point should be checked further.

Placement with anhydrous ammonia and nitrogen solutions poses a somewhat different problem. In general, anhydrous ammonia is preferred as a preplanting application around five inches deep in the row. The ammonia creates a zone of intense alkalinity for a short while, after which the soil gradually returns over a period of several weeks to a slightly more acid condition than at the beginning. When used as a side dressing the application should be as far from the plant as the stage of root extension would permit. We have practically no research information on placement of nitrogen solutions for cotton. Since we know their composition, however, we can arrive at the conclusion that they should be placed beneath the soil surface to prevent volatilization loss, and must be kept two to three inches to the side and below the seed to avoid damage.

Quality Challenges in Cotton Breeding

EARLY C. EWING, JR., Cotton Breeder, Delta & Pine Land Co., Scott, Miss.

Cotton quality means many things but in relation to cotton breeding there are two phases. These phases concern the quality factors which are related to production practices on the one hand and to the inherent fiber properties on the other.

First, what are some of the interrelationships of quality and production? It requires only a moment's reflection to see that such things as disease resistance or insect resistance as they contribute to healthy productive plants also produce stronger, more mature and cleaner fiber. Earlier varieties enable us to get the cotton out of the field before the onset of bad weather so that we get higher grades and more efficient use of our machines. Such improvements when derived from new and better varieties can significantly cut production costs.

• **Mechanization Challenge to Quality**—The reality of mechanization is a great challenge to breeders. Prospects are good for new smooth-leaved varieties to appear on the market soon. They promise to increase the quality of machine picked cotton from one quarter to one full grade. Such improvements do not happen overnight. We have had smooth cottons in the Delta since S. L. Calhoun developed the experimental variety, Delta Smooth Leaf, at Stoneville in 1940. That variety was, however, late and low in productivity. These difficulties were overcome by 1951 but even though yield was high the fiber was short, course, and weak. Now, we feel that this quality problem, too, is near solution. It took quite a time but, actually, progress was very rapid as compared with some of the other characters with which cotton breeders are working.

Some breeding objectives require alteration of the nature of the plant itself. Take for example one which involves the basic physiology of cotton. As you know, cotton fruits over a period of time, during which many forms are shed. Will we find some chemical which will modify this pattern so that we can reduce shedding and shorten the time necessary to set a maximum crop? We might then get more of our crop in the first picking with less weathering of early cotton and less damage to late bolls from premature defoliation.

A farmer usually gauges the success of his crop in terms of his yield per acre. As our investment in land and machinery increases and our labor and fixed costs continue to rise, a bale per acre looks more and more like a failure and less and less like the new car and trip to the city that such a yield used

Increased field of Breeders Registered Coker 124 Cotton growing on the Thomas plantation near Lake Cormorant Miss. On left, Douglas J. Thomas, owner, shown with Robert R. Coker, President, Coker's Pedigreed Seed Co., Hartsville, S. C.

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- GOOD STAPLE LENGTH
- EASY TO PICK by hand or machine

"This is a fine cotton. Being in the cotton business, it is easier to sell. It brings about 1¢ premium. Yield about 1-4/5 bales per acre. Staple length 1-3/16 to 1-1/32. It is most desirable for machine or hand picking."

October 22, 1956

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to guarantee. It is most fortunate that those factors which favor maximum yields also give good quality lint. For example, in the Central Belt our scorching dry years give us unusual fiber strength, but it is usually coupled with short staple, low yields, and some immature fiber. Making up this deficiency of moisture with irrigation produces a good crop of normally strong, uniform, and mature fiber. The more we can learn about the interrelationships between the cotton plant and its environment, the more we can do through breeding and agronomic practices to compensate for unfavorable climatic or other conditions.

• **Fiber Quality** — Now let's consider the matter of breeding for improved fiber properties. Now a days we are able to recognize more of the properties and relate them more specifically to the use of the cotton.

New fiber properties are simply elements of character which we have had all along. Without our modern fiber testing instruments, however, such properties were very difficult to define in specific terms or in dollars and cents. The development of instruments for measuring fiber properties and their use by breeders has resulted in very significant quality improvements. For example, J. E. Hite reported in 1953 that from 1940 to 1950 the average length of staple increased six percent or five-hundreths inch with an increase in tensile strength of 6.7 percent or five thousand pounds. Individual variety increases in strength were as much as 16,000 pounds, directly attributable to to the efforts of cotton breeders.

Improved qualities offer good prospects of new markets for cotton as a replacement for non-cotton materials. Such markets, although they total five million bales, will be very difficult to crack directly—in some cases because of a price differential, in others because of some quality factor in the present material which cotton does not now have. Some of these are crease resistance, drape, luster, quick drying, resistance to soiling and staining, and warmth. The development of new finishes or treatments may open up some of these outlets to cotton.

In another approach, a considerable effort is being made to determine the fundamental chemical and physical properties responsible for these quality factors. This is a long term project and involves such things as the study of infinite numbers of single fibers, x-ray, and electron microscope study of the structure of cotton fibers, as well as experiments to determine chemical differences in cotton's cellulose foundation. These properties then must be related to properties of fabrics. Rapid and cheap means of measuring these chemical or physical differences will open new possibilities to cotton breeders.

• **New Fiber Types** — Even now in fact, we are developing new, basically different and, mills say, very useful types of fiber. A good example of this is the Hopi fiber. It can be described as a thick-walled, tubular fiber as compared with the thin-walled, twisted or convoluted, ribbon-like fiber of normal Upland cottons. This Hopi fiber, named for the Indians who cultivated it before the white man came, is very strong, very mature, and has a lustrous appearance. There are also indications that the fiber is more easily cleaned in the ginning process. Because of a low yield potential it is being grown in a very limited way. As this yield deficiency is overcome it should prove a valuable addition to our range of qualities in cotton.

The possibility of increasing the quality of cotton in terms of its efficiency in the mill, in addition to its end use value, is a real one. Costs of production are as important to the spinner as to the farmer. To judge by what we pay for a shirt, the price of cotton is not the spinner's only cost factor. Fiber properties can materially affect the way cotton runs in the mill.

The realization of some of the possibilities mentioned above would logically lead to the development of cotton varieties for specific end uses. There are many handicaps to the exploitation of such a variety which we cannot discuss here. It is worthwhile to point out, however, that some very specialized cottons are in commercial production today. American-Egyptian is a good example. So are the Sea Island cottons of the British West Indies, which are adapted in relation to price to such a small end use market that 4,000 bales of cotton per year is an ample supply. In both these examples end uses depend primarily on staple length and a unique character, the first determined by classing and the latter by variety, season, and location.

In closing, may I present what appear to be important quality challenges which face the industry today.

Research on the fundamental physical and chemical properties which influence the end use capabilities of cotton fiber is needed, together with development of quick and rapid means of measuring these factors. Success in this should strengthen present markets and open new ones.

Research on the physiology and growth of the cotton plant is desirable to open new avenues of approach to our production and quality problems. In view of the success of hormone sprays to control blossom set and regulate the growth of other crop plants, good results with cotton appear to be a distinct possibility.

We need increased coordination among those engaged in related lines of work. This is needed to provide for the best utilization of our research and developmental resources.

Ginners Will Meet In Little Rock

Members of Arkansas-Missouri Cotton Ginners' Association and representatives of allied groups have completed plans to meet Monday and Tuesday, Jan. 7-8, at the Marion Hotel in Little Rock. This is the third Industry Conference sponsored by the Association.

Committees from the board of directors will study problems of cotton production, ginning, merchandising, warehousing, cottonseed, fire prevention and safety, labor relations and fuel at separate meetings during the Conference.

The program announced by W. Kemper Bruton, executive vice-president, calls for a closed directors' meeting at 9:30 a.m. Monday, followed by a general meeting at 10:30. Committee meetings and a social hour and buffet are planned in the afternoon. Committee reports will be made at a general meeting the next morning, with adjournment at noon.

Cost Reduction and Quality Improvement From Cotton Disease Control

DR. G. M. WATKINS, Head, Department of Plant Physiology and Pathology, Texas A. & M. College, College Station.

Certainly no cotton grower can afford to ignore the effects of controllable diseases in his field. Diseases can sharply reduce his volume of production; they can lead to reduced **prices** because of quality damage; they can increase the **cost** of growing cotton. In short, they can drastically reduce the farmer's net income.

Let's look first at the various effects of the seedling disease complex, which does more damage than any other class of disease. The term "complex" may seem puzzling, but the situation is a complex in two senses of the word. First there is a complex of common soil fungi involved as causal agents, which can be different from one place to another, and from one time to another. Also, there is a complex of related but distinct symptoms, which include decay of seed in the ground, pre-emergence and post-emergence damping-off and seedling root rot.

Whichever the causal fungus and whatever the symptoms shown, the seedling disease complex means reduced stands. When the loss of stand is great enough, the grower must replant the field. This increases operating cost by the price of the seed, labor, fuel and machinery required for replanting. Also entailed in the replanting is a delay of two or three weeks while the first planting is being given up for lost and the decision is reached to replant. What are the possible consequences of such delay? If irrigation is involved, there may be another application of water, a cost increase. Reports are occasionally heard of cotton fields in which insect control was abnormally difficult, because the field was later than others of the community. An increased cost or a reduced volume. At high altitudes or northerly latitudes within the Cotton Belt, the growth season is barely long enough to produce a crop of cotton. A delay of three weeks may cause the crop to be caught with immature bolls by the first frost. The resulting poor quality brings a lower price along with a probable reduction in volume. It is not my intention to claim that all the disasters just mentioned are likely to befall any single field of cotton. It is obvious, however, that this single disease of cotton acts in enough varied ways to be able to influence adversely all the basic factors that go into net income—price, volume and costs.

• **Bacterial Blight** — Let us see how the second-ranking trouble maker works—

(Continued on Page 20)

• Texas Cotton Team Has Busy Program

A COTTON TEAM, Texas Extension Specialists F. C. Elliott, F. M. Fuller, Jr., and Joe R. Jones, has outlined a full schedule of cotton work for early 1957. To aid better cotton production, insect control and ginning, the three specialists will have many meetings with County Agents, farmers, ginners and others.

District and sub-district training meetings will be stressed in the 1957 Seven-Step Cotton Program, with County Agents receiving training which they can use with producers.

The following schedule of meetings will be supplemented by others, to be set later:

Jan. 7-11—Training meeting in Extension District 12.

Jan. 14-18—Extension staff conference at College Station.

Jan. 21-22—Texas Cotton Ginners' Association directors' meeting.

Jan. 23-25—Lower Rio Grande Valley county meetings.

Jan. 29—Lamar County Seven-Step Cotton Meeting.

Feb. 4-5—Texas Federation of Cooperatives meeting.

Feb. 6—Texas Prison System meeting.

Feb. 7—Wharton County Cotton Clinic and Colorado County meeting.

Feb. 8—District 11 training meeting.

Feb. 11-12-13—Sub-district meetings in District 8.

Feb. 14-15—District 9 sub-district meetings.

Feb. 18-22—District 4 sub-district meetings.

Feb. 26-27—District 5 sub-district meetings.

Cotton Ginned to Dec. 13

Number of bales of cotton ginned from the growth of 1956 prior to Dec. 13, 1956, and comparative statistics to the corresponding date in 1955 and 1954 are listed below.

State	Ginning (Running bales—linters not included)		
	*1956	1955	1954
U.S.	**12,788,884	**13,713,519	**13,017,808
Alabama	742,249	1,026,770	736,883
Arizona	704,821	524,264	746,444
Arkansas	1,369,065	1,568,159	1,329,745
California	1,391,680	1,023,975	1,269,953
Florida	9,178	14,763	16,265
Georgia	574,841	686,782	612,738
Illinois	2,424	1,477	2,628
Kentucky	7,517	6,957	8,159
Louisiana	567,723	564,136	560,505
Mississippi	1,571,191	1,940,186	1,555,251
Missouri	438,263	396,473	446,495
New Mexico	271,954	227,891	283,932
N. Carolina	351,463	351,166	375,148
Oklahoma	251,374	434,395	285,901
S. Carolina	514,756	560,970	514,814
Tennessee	521,859	564,086	530,861
Texas	3,488,595	3,810,990	3,732,520
Virginia	9,931	10,079	9,566

*The 1956 figures include estimates made for cotton gins for which reports were not obtained in time for use in the preparation of this report. Figures on cotton ginnings prior to Dec. 13 were collected by mail and reports were not received for all cotton gins at which cotton had been ginned.

**Includes 404,845 bales of the crop of 1956 ginned prior to Aug. 1 which were counted in the supply for the season of 1955-56, compared with 313,958 and 388,229 bales of the crops of 1955 and 1954.

The statistics in this report include 40,061 bales of American-Egyptian for 1956, 29,279 for 1955, and 32,582 for 1954.

The statistics for 1956 in this report are subject to revision when checked against the individual returns of the ginners being transmitted by mail. The revised total of cotton ginned this season prior to Dec. 1 is 12,386,651 bales.

New Bulletin

USDA PUBLISHES COTTON TEST INFORMATION BULLETIN

USDA has published Bulletin No. 167 entiled "Bleaching, Dyeing and Mercerizing Test Results on Some Varieties of Cotton Grown by Selected Cotton Improvement Groups, Crop of 1955."

The publication provides information with respect to the performance in the chemical finishing processes of representative samples of cotton from the 1955 crop. The fiber characteristics and spinning performance of these cottons were reported in Bulletin No. 152. The purpose of these reports, says USDA, is to aid cotton merchants and manufacturers in locating sources of cotton possessing the fiber characteristics and spinning performance desired for specific uses.

Boy Makes 1,375 Pounds Of Lint To Win Prize

A 13-year-old-boy produced 1,375 pounds of lint cotton per acre to win the 1956 Texas Lower Valley Cotton Production Contest. He is James Allen Stephenson, a member of the Rio Farms 4-H Club, of Edcouch, Texas. The two-and-three-fourths bale yield was produced on irrigated land. He carried out a well-planned fertilization and insect control program.

The contest is sponsored annually by the Valley Farm Bureau for 4-H and FFA boys in the Valley area. Cotton projects are supervised by vocational agriculture teachers and County Agents.

India Lists Cotton Export Quotas for 1956-57

The government of India has announced cotton export quotas for the 1956-57 season of 163,300 bales of 500 pounds gross effective Dec. 1, 1956 This quantity includes 40,800 (50,000 Indian bales) of Bengal Desi cotton, and 122,500 bales (150,000 Indian bales) of other short staple cotton, says USDA.

Announcement also was made effective Dec. 1, 1956, of an increase in the export tax on Bengal Desi cotton from 50 to 100 rupees per Indian bale, equivalent to an increase from 2.66 to 5.32 U.S. cents per pound. The export tax on all other cotton remains unchanged at 50 rupees per Indian bale, equivalent to 2.66 cents a pound.

Chemists Making Plans

Plans for the forty-eighth annual meeting of American Oil Chemists' Society are being developed in New Orleans, where the meeting will be held April 29-May 1, 1957, at the Roosevelt Hotel.

The AOCS Journal has announced that Ralph M. Persell, Southern Regional Research Laboratory, will be general chairman; and R. T. O'Connor, SRRL, program chairman. T. H. Hopper, president of AOCS, is also a member of the Laboratory staff.

■ **DR. T. R. RICHMOND, USDA cotton breeder, College Station, Texas, has been honored by election as a fellow in the American Society of Agronomy.**

South Plains Maid Gets Big Send-Off

SOUTH PLAINS leaders saw to it that their choice for the new Maid of Cotton, Sherry Sinex of Texas Technological College, got to Memphis in fine style. Six planeloads of South Plains husbands and wives accompanied Sherry on her flight, stopping at Fort Worth and Dallas for welcomes from cotton and civic leaders. Sherry participated in the finals being held in Memphis as this issue went to press. This picture shows George W. Brassell, Jr., Lubbock, chairman for the 1957 South Plains Maid of Cotton Contest and official representative of the City of Lubbock, who presented a cotton gift to Dallas Chamber of Commerce President W. W. Overton, who welcomed the group; Sherry Sinex is an interested spectator. The brief Dallas ceremonies were attended by a number of ginning, gin machinery and other cotton industry leaders. Arrangements were made by a committee which included Ed Bush, executive vice-president, Texas Cotton Ginners' Association; Jack Craugh, vice-president of the Dallas Cotton Exchange; Andrew DeShong, assistant manager, Dallas Chamber of Commerce; Karl Hunt, secretary, Dallas Cotton Exchange; Walter B. Moore, editor of The Cotton Gin and Oil Mill Press; W. D. Felder, Jr., president, and Ayres Compton, public relations counsel, American Cotton Shippers' Association; Roger L. Dixon, Dallas cotton leader, and Jack Whetstone, secretary-treasurer, Texas Cottonseed Crushers' Association. T. J. Harrell, past president of Texas Cottonseed Crushers' Association, headed the welcoming group at Fort Worth.

as viewed from The "PRESS" Box

• Protein Saving

PROTEIN SAVING through the use of methionine and lysine supplements is the objective of research at Du Pont's Stine Laboratory. The work, reported to the American Chemical Society, is summarized in the firm's November-December Agricultural News Letter.

• Gins Improve Service

LINT COTTON GRADES at Alabama gins will improve in 1957 because of installation of stick removers and other improved equipment, says Lawrence Ennis, Extension engineer. Ennis says that most modern gins in the state will install the machinery before starting 1957 ginning.

• Sack Sets Record

A JUTE SACK found in England probably has set a record of long service to agriculture. Still in good condition, the sack has been used for 82 years. It was discovered in a group of grain sacks during the 1956 harvest, and still bears the name of a firm and date of 1874.

• Vegetable Oil Featured

VEGETABLE OIL is being featured by Cabell's of Dallas in its sugar-free, low-fat frozen dairy dessert, "Diet". Says a folder distributed by the firm, "Cabell's new Diet contains no animal fat for the benefit of those who believe that consumption of animal fat has a direct bearing on the formation of cholestrol in the blood vessels."

• To Identify Dacron

DuPONT will start identifying the Dacron in men's suits, slacks and sport coats containing 55 percent or more Dacron. Tagging so customers will readily know the Dacron content will start with 1957 fall clothing for men.

• Thoughtful Message

W. L. GRIFFIN, president of New Mexico Cotton Ginners' Association, discussed cotton industry problems in his thoughtful holiday message to members of the Association. He stressed the need for labor saving, modern equipment at gins and other practices to strengthen the industry.

• Learn To Grow and Sell

STUDENTS at Arizona State College at Tempe learned to produce and market cotton this season. Dr. Grant Richardson's class produced 117 bales from 43 acres. They then installed a telephone line in the classroom for one day and received bids from 16 cotton buyers. The cotton sold for 35.15 cents per pound, with the income to be used to defray costs and save taxpayers' money

• 11,000 New Jobs

TEXTILE WAGE INCREASES recently granted in South Carolina are the equivalent of adding 11,000 new jobs, says R. M. Cooper, director of the State Development Board. The state's average manufacturing wage is $2,614.84 annually, while the textile wage increase of 10 cents an hour totals $30 million yearly.

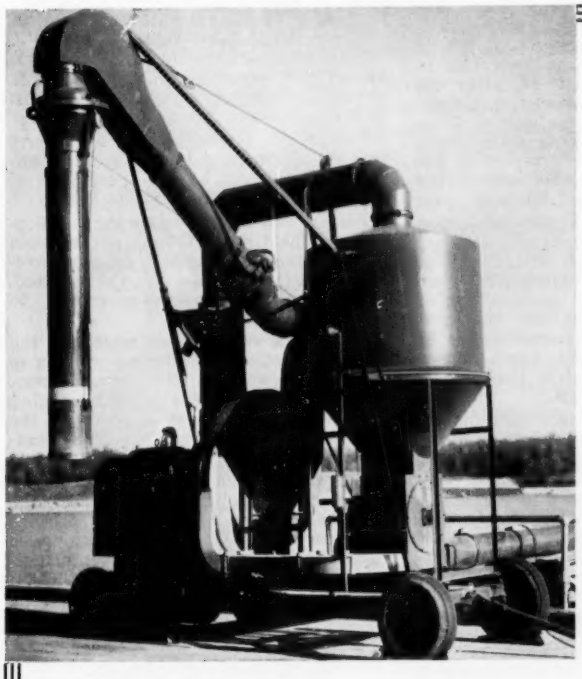
• Xmas-Tree Bootleggers

BOOTLEGGING of Christmas trees is the newest crime. Mexican officials arrested four men and seized six burro-loads of trees because of violation of the ban on cutting trees to prevent "systematic Christmas deforestation."

• Americans Not Well Fed

AMERICANS are not well fed. As compared with some other countries, we eat far less red meat, milk and dairy products, says Herschel D. Newsom, master of the National Grange. Red meat consumption is less than 175 pounds per capita, ranking the U.S. fifth among nations. Five other countries use more milk per capita than we do. The Irish use nearly 1,500 pounds of milk and dairy products per person, about twice the U.S. figure of 700 pounds.

■ **WILLARD C. LIGHTER has been named executive vice-president of The Glidden Co., Cleveland.**



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• Rules on Acreage Reserve Listed

ACREAGE RESERVE provisions of major importance in the 1957 Soil Bank program that have been announced by USDA include the following:

Deadline for signing 1957 Acreage Reserve agreements for cotton will be March 1.

A national allocation of 1957 Acreage Reserve funds among the commodities to be covered in the 1957 program—wheat, corn, upland cotton, tobacco, and rice.

A breakdown of these commodity allocations among producing states and counties within them.

Establishment of maximums on the amount of acreage of a particular crop that an individual farmer can place in the Acreage Reserve, with a provision that this maximum may be exceeded if funds are still available after all farmers have had an opportunity to participate.

There will be no minimum acreage limitations on the amount of land that may be entered in the program except those already in effect for 1957 wheat.

National allocations of 1957 Acreage Reserve funds by commodities are; Cotton, $217,500,000; corn, $217,500,000; rice, $14,000,000; tobacco, $34,055,000; and wheat, both winter and spring, $267,630,000—a total of $750,685,000. This is $685,000 above the $750,000,000 set by the Soil Bank law for any year's operation of the Acreage Reserve program. Department officials explained that this excess is to take care of "slippage"—money that may be committed, but which will not be used because not all agreements will be carried out or qualified for the full commitment.

State allocations were determined after taking into account state acreage allotments for a particular commodity, land productivity, estimated extent of participation in the program, supply and demand conditions for different classes, grades and quality of the commodity produced in the several states, distances from markets, and historic prices. The states will use similar factors in allocating funds to their counties.

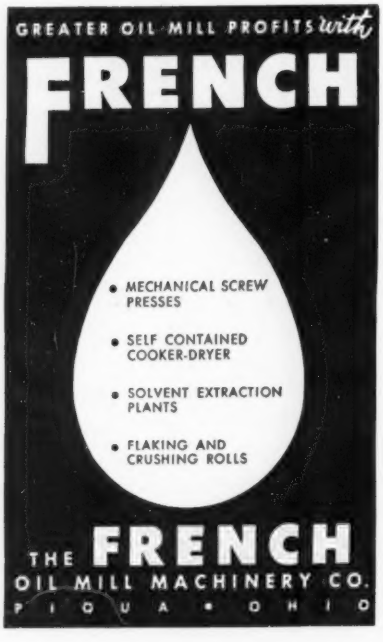
Limits on extent of participation in the 1957 program provide that the acreage for any commodity placed in the Acreage Reserve by a farm shall not exceed that farm's allotment for the commodity. Within this limitation, the maximum acreages that may be originally entered for a farm are: Wheat, 50 acres or 50 percent of the farm allotment, whichever is larger; corn and rice, 20 acres or 30 percent of the allotment, whichever is larger; cotton, 10 acres or 30 percent of the allotment, whichever is larger; and burley, dark air-cured, fire-cured, and Virginia sun-cured tobacco, 1 acre or 30 percent of the allotment, whichever is larger; and for all other tobacco, 3 acres or 30 percent of the allotment, whichever is larger.

Applications for Acreage Reserve agreements are to be accepted within these limits by county Agricultural Stabilization and Conservation committees on a "first come, first served" basis to the extent county funds are available. Farmers wishing to participate above maximum acreage limits for a particular crop must indicate this in their original agreement. If, after the sign-up for a crop has closed, funds are left over, or can be reallocated from another county or another state, these additional acres will be accepted to the extent funds are available and within instructions to be issued later.

Only land suitable for the production of the commodity covered by an agreement will be eligible for designation as the Acreage Reserve. County ASC committees may also reject designations of tracts which are of such size, shape, or nature as to make it impracticable to determine performance of an agreement or will tend to defeat the purpose of the Soil Bank program.

County ASC committees will inspect land offered for the Acreage Reserve to determine if it is suitable for the production of the commodity involved and whether it has been properly designated in the agreement.

Under the Soil Bank law, the rights of tenants and sharecroppers are protected. Regulations in effect this year provide that county ASC committees may not approve an agreement if the landlord or farm operator, because of participation in the Soil Bank, reduced the number of tenants or sharecroppers on his farm. A new provision specifies that if a tenant or sharecropper leaves a farm voluntarily, or for some reason other than being forced off, the failure to replace such a tenant or sharecropper will not bar the landlord or farm operator from an Acreage Reserve agreement.



Associations To Move Offices

The officers and directors of the Oklahoma Ginners' and Crushers' Associations have voted to move their offices to the Bettes Building, which is now under construction at 14th and Classen Blvd., Oklahoma City. The move is is scheduled for July 1, 1957.

Smith Named Director

WILMER SMITH, Wilson, Texas, a cotton producer who has served as president of Texas Cooperative Ginners' Association and Plains Cooperative Oil Mill, Lubbock, and vice-president of Plains Cotton Growers, Inc., has been appointed a director of the Central Bank for Cooperatives in Washington.

• Council Head Asks Import Control

THE PRESIDENT of the National Cotton Council has urged immediate action to limit U.S. imports of foreign textiles. In a telegram to Secretary of Commerce Sinclair Weeks, Col. F. J. Beatty of Charlotte, N.C., said this is needed to prevent injury to the U.S. cotton industry and protect its biggest market—domestic textile mills.

Copies of the telegram also were sent to Sherman Adams, the assistant to the President, and to Secretary of Agriculture Ezra T. Benson.

Beatty stated that, following the adoption of the Cotton Council's resolution at its annual meeting last January, every effort was made by the Council, along with other interested groups, to solve this problem.

"This is a very serious matter to the American cotton producer as well as to the American cotton manufacturer, since imported textiles are threatening the welfare of the best customer of the American cotton farmer," Colonel Beatty said.

"Japanese mills can sell textiles in this country cheaper because their wage levels are far below ours and because they can buy their raw cotton at prices considerably below the government-supported American price.

"Unless this situation is dealt with adequately, the raw cotton industry has no alternative but to seek remedial action through legislation."

■ **ROBERTA REUBELL, member of the staff of Oklahoma Ginners' and Crushers' Association, and her husband have been presented with a picture for their new home in Oklahoma City by the associations which she serves so well.**

This field was mechanically harvested... and yielded 2½ Bales per acre!

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Medium-early Maturing
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- Fast Fruiting • Early Maturing
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DELTAPINE STAPLE ORIGINATORS OF DELTAPINE PLANTING SEED TRADE MARK

Breeder's Registered

DELTAPINE STAPLE

- A new variety bred to give the highest Lint Percentage of any cotton of equal staple length. (34% to 36%)
- 1⅛ Inch Staple.

A successful cotton farmer of Mounds, Louisiana, E. C. Woodyear, is a man who believes in the full use of mechanized farming methods — and equally important, the use of good planting seed — as a means of increasing his productiveness of labor.

This field of cotton was planted in 1955 to Deltapine 15, the big brother in the family of fine cottons bred by Delta and Pine Land Company. From the 150 acres represented in this photograph, Mr. Woodyear actually harvested 375 bales of cotton — an average of 2½ bales of top-quality cotton per acre!

Behind these Deltapine Cottons are many years of research aimed at developing varieties from which the farmer can expect to produce premium quality cotton under a variety of farming conditions and practices. Scientists at Delta and Pine Land Company have succeeded in matching the rapid advancements made in the cotton industry; they have developed cottons that are heavy yielders, adaptable for belt-wide production . . . cottons that are in highest demand by cotton manufacturers . . . cottons that can be profitably produced, with no sacrifice in quality, because of their high degree of adaptation to mechanized farming methods.

Plant Breeders Registered Deltapine 15, D&PL-Fox or Deltapine Staple . . . the cottons that are bred to make labor more productive and investments more profitable.

DELTA & PINE LAND CO.

SCOTT, MISSISSIPPI • BROWNSVILLE, TEXAS

BREEDERS OF THE BELT'S BEST COTTONS

Preserving Cotton Quality

■ **EMPHASIS on better mechanical harvesting is helping growers, Extension Specialists William E. Woodall and Paul M. Spurlock point out in this article on Arkansas educational work.**

IS THERE A NEED for an educational program on quality harvesting in Arkansas? Arkansas Extension Service feels that there is.

About 50 percent of Arkansas' agricultural income is derived from cotton. Mechanical harvesting has increased from two percent in 1952 to about 25 percent in 1955. Estimates are that the final figure will be up another seven and one-half percent in 1956.

We are not saying that good quality cotton cannot be harvested mechanically, but rough harvesting is usually associated with areas where mechanical harvesters increase at a rapid rate. This is due to the failure to carry out good cultural practices necessary for quality harvesting and to the inexperience of the producers in the operation and adjustment of the machine. In some instances, gins are not equipped to handle machine-harvested cotton.

Since cotton is Arkansas' No. 1 cash crop, we feel a definite responsibility to the cotton producer, and we strive to conduct an educational program that will enable him to obtain the largest dollar return possible from his cotton operation.

In order that the cotton producers of Arkansas can have the benefit of a well-rounded educational program, the Extension Service employs a cotton specialist who devotes full time to the cotton program. A number of other specialists devote a considerable amount of their time to the state's cotton program—from planting through marketing. These are: two agricultural engineers, plant pathologist, entomologist, soils specialist and an agricultural economist.

• **Must Meet Competition** — Cotton has its problems at the present time. Opinions are many and varied as to what can or should be done to improve the cotton economy. Many of the problems are interrelated and complex. One of the things that we in Arkansas feel is vital to its future is the preservation of its quality.

The mill people are particularly concerned about tar spots, green leaf stain, grease and oil, colored threads, excess trash, picker twist, over drying at the gin, plant bark, grass, mixed qualities of cotton within a bale and receiving bales inadequately wrapped.

U.S. mills are our most important market and every effort must be made to deliver to them the quality of cotton they want. All-out effort to preserve the built-in qualities of our cotton will go a long way in holding our present markets and helping us to gain new ones.

Most of the things objected to by the mill people can be eliminated or greatly improved by the producer with little or no additional cost to him.

Earlier in the year the National Cotton Council, Extension Service, machinery manufacturers, gin groups and others met to discuss cotton quality preservation. At that time it was agreed that the mill people were justified in many of their complaints about receiving contaminated cotton or otherwise low-quality cotton. Plans were made to carry the quality preservation story to the farm people.

We felt our best approach to the problem would be through county educational meetings on "Mechanical Harvesting for Quality Cotton."

Harvesting for quality with mechanical cotton pickers was highly publicized and a much-discussed topic during the late summer and fall months in all of the cotton producing counties of Arkansas. Arkansas Extension Service conducted a series of county-wide educational meetings on cotton quality preservation. The meetings were conducted, in the most part, by a local team consisting of the County Agent, implement dealer, two ginners and a local farmer. A representative of the USDA cotton classing office presented a display of samples from mechanically harvested cotton showing contaminants and quality-damaging factors such as bark, grass, picker twist and green leaf stain. After the defects of the samples were pointed out, he explained how much these contaminants or quality-damaging factors were costing the producer per bale.

Our meetings were unique in that the Extension specialist prepared the necessary background information for the local people to present for their part of the program. From there on it was strictly a local meeting with no state or out-of-state assistance, other than in the question and answer period at the end of the program where the state Extension specialists participated.

To emphasize further quality preservation, machinery dealers held local owner-operator schools for persons owning or operating their make of pickers, and Arkansas-Missouri Ginners' Association stressed quality preservation at their district meetings.

All segments of the Arkansas cotton industry have stressed cotton quality preservation during the fall of 1956 and personal observations and reports from over the state indicate that a good start has been made in preserving cotton's quality in Arkansas.

Farm Producers Keep Pace With Population Gains

USDA reports that world production of crops and livestock rose to a new high level—120 percent of prewar (1935-39)—in 1956-57. The level was 118 percent in 1955-56, and 116 in 1954-55. The corresponding percentages for the Free World alone for those seasons were, respectively, 126, 125 and 122.

On a per capita basis, taking into consideration rising world population, production in 1956-57 is holding steady at 97 percent of prewar for the third consecutive year.

Record stocks of some of the more staple products, such as wheat, corn, cotton and tobacco, were carried over into the current marketing year, and substantially augment supplies from the all-time-high 1956-57 output. Stocks of staple products may level off or be reduced during the current season, says USDA, because of improved food consumption and high industrial activity. World cotton stocks may be reduced by two million bales, and wheat consumption may approximate this year's production, resulting in only slight change in carry-over supplies.

Rice supplies which appeared burdensome in early 1956, were almost completely sold out by the beginning of the new crop year. Stocks of dairy products, wool, fats and oils, beans and grass and legume seeds have also been reduced significantly and are at about normal world trade requirements.

Prices of most farm products remained relatively stable in 1956. Reduction in world cotton prices during 1955-56 has encouraged consumption of cotton textiles, discouraged substitution of synthetics and markedly increased world trade in cotton. U.S. cotton exports are increasing rapidly following the sharp decline in 1955-56 when prices were maintained above world levels.

4.2 Bales Per Acre

Morrison Brothers, Higley, Ariz., reported that they averaged 4.2 bales per acre on 795 acres of cotton skip-row planted this season. While skip-row operations cost more and are more difficult, the results justify the difference, the brothers told Arizona Farmer-Stockman.

■ **G. C. CORTRIGHT, JR., Rolling Fork, Miss., has been named a producer delegate to the National Cotton Council.**

$1,600,000,000 Value of Shipments By 437 Oil Mills in 1954

Products shipped by 437 vegetable oil mills in the U.S. in 1954 were valued at more than $1,600,000,000, preliminary figures issued by the Bureau of Census show.

These plants had more than 24,000 employees and their payrolls exceeded $87,250,000, the Bureau's report shows. Capital expenditures during 1954 were approximately $24,000,000.

Details regarding locations of the mills by states are available in 1954 Census of Manufactures Advance Report, Series MC-28-7. This may be bought for 10 cents from U.S. Department of Commerce field offices or the Bureau of Census, Washington 25. The following figures show the information by major classes of mills:

	Number of Mills	Number of Employees	Payroll	Value of Shipments	Capital Expenditures
			(In thousands of dollars—add 000)		
Cottonseed	286	13,665	$43,103	$546,430	$11,680
Soybean	88	6,922	29,453	826,362	8,479
Linseed	12	1,263	5,625	139,619	1,311
Others	51	2,460	9,198	165,982	2,470

In the Far West

Castor Beans May Be a Major Crop for U.S. Farmers

■ **WORLDWIDE DEMAND for castor oil has brought extensive research work in California and Arizona. Favorable growing conditions are present in these states.**

CASTOR BEANS, the oilseed which U.S. farmers have tried to grow since World War I with very limited success, may become established as a permanent crop in the Far West, California and Arizona observers indicate.

Worldwide demand for castor oil has encouraged U.S. efforts to grow the beans commercially for many years, but domestic production has been of any size only when supported by price subsidies or other means. [USDA estimates that only 5,500 acres of castor beans were harvested in 1956, producing 1,000 tons of oil (out of 70,000 tons or more used in this country.) This contrasts with the 1953 peak of 51,343,539 pounds of castor oil produced in 1953, when growers had government price supports.]

Need for alternative crops on land taken out of cotton, the development of better equipment and other factors may cause Arizona and California to plant more castor beans in 1957, however.

• **Arizona Encouraged** — In Arizona, reports the Valley National Bank of Phoenix, "castor beans are still a major contender for the title of a permanent new crop, despite lack of enthusiasm among many growers during the past two years."

Arizona last year devoted about 1,100 acres to castor beans, with most plantings yielding around 3,000 pounds to the acre. "If the world market holds up to its present level of eight cents a pound," comments the bank, "such yields will net growers a very satisfactory return."

• **15,000 Acres in Kern?** — California Extension Agronomist Milton D. Miller recently issued a mimeographed summary of the castor bean situation in which he says, "lack of a reasonably efficient mechanical harvestor is no longer a limiting factor to castor bean production."

Kern County Farm Advisor Roy M. Barnes reports that one company wants to contract for 15,000 acres or more of castor beans in that area of California in 1957. "After 10 years of testing," says Barnes, "it has been concluded that castor beans are well suited to the area.

"Varieties have been developed which produce good yields on plants that do not grow objectionably tall, which are available for planting. The value of the commodity is such that a reasonable profit can be realized. With proper care and management, yields of 3,000 to 4,000 pounds per acre may be expected. Yields as high as 5,300 pounds have been attained."

• **Situation Summarized** — Extension Agronomist Miller, at a recent Kern County meeting, summarized the castor bean situation. Excerpts from his summary follow:

There is a rapidly expanding demand for castor oil.

World production of castor beans has been virtually static for over 20 years. This is due principally to the limited areas in which the crop grows and to production problems. World castor bean production averaged 474,195 short tons in 1935-39 and 492,530 short tons in 1945-49; output has ranged from 531,000 to 571,000 tons from 1950 through 1955.

The U.S. is using a minimum of 70,000 tons of castor oil yearly, indicating that it would take about 350,000 acres of beans at present yields to supply the domestic market, Miller added.

He listed castor oil production in the U.S. during the past 10 years as follows: 1947 — 210,764 pounds; 1948 — 480,384; 1949 — 683,832; 1950 — 7,358,238; 1951 — 20,849,011; 1952 — 24,570,106; 1953 — 51,343,539; 1954 — 10,831,036; 1955 — 3,409,490; 1956 — 5,200,000.

(U.S. supported castor bean prices at nine to 10 cents a pound during the three peak years of production, dropped the support price to six cents the following year, and had no support for prices in 1955 and 1956.)

Oil company officials report that when castor bean prices go below six cents a pound, even in foreign lands, farmers switch to other crops. It is the concensus that a domestic price to U.S. farmers of from six and one-half to eight and one-half cents a pound for castor beans will be economically attractive to farmers, oil crushers and processors alike. Currently, castor beans are $180 per metric ton, fob Brazilian ports (eight and one-half cents a pound). Shipping charges to U.S. crushing plants from foreign ports add about $1.25 per pound to the cost (about $25 per ton on the average).

Plant breeders have produced and now have available in commercial quantities seed stocks of hybrids which are good yielders, and adapted to mechanical harvesting. USDA plant breeders have some interesting dwarf types which may become available for commercial use in several years.

• **New Crop for Cotton Land** — In California the castor bean plant seems well adapted to the valley areas, especially to the Cotton Belt. Cotton farmers facing even tighter production controls may find castor bean growing attractive, especially since it is a crop which will not be in direct competition with cotton.

From a national standpoint, the Southwestern States, especially California and Arizona, may develop into the principal states of production. In these areas the requisite long growing season (about 15 days), favorable temperature, dry atmosphere, especially at harvest time (October-November), good soil and irrigation facilities seem to abound in correct proportions. These conditions insure good yields per acre, and expedite mechanical harvesting.

• **Better Mechanical Harvesting** — More efficient mechanical harvesting is now possible thanks to pioneering work done by many. Out of this research has come a machine which can harvest beans at a rate of 0.8 to 1.3 acres per hour, with a threshing loss varying from four to 10 percent. This is a self-propelled machine which currently can be purchased at a cost of around $14,500.

Another machine apparently works fairly well under California conditions. It is a mounted row crop tractor, and is based on approximately the same principles as the other machine. In performance checks by the University of California, its threshing loss was about the same. Currently it is quoted at about $5,900 fob Phoenix.

Both these machines seem to perform better than the combines. However, the final word on how to thresh castor beans has not yet been given. Even though these new machines perform reasonably well, they are rather expensive for the small-scale farmer. A partial answer to this problem is coming in the form of custom operators. It is certain, too, that further modification and improvement in castor harvesters will take place in the future.

• **New Use for Oil**—The latest development on the castor horizon is the announcement by the French company, Organico, that it has licensed a large U.S. firm to manufacture nylon and rilson using its patented process which employs castor oil derivatives almost exclusively. This new manufacturing effort should create a U.S. demand for an additional 30 to 50 million pounds of castor oil annually.

Cotton Winner Crowned

KING DONALD NEUMANN of Tallulah, La., left, is awarded a check for $100 by Thomas L. Moore, sales manager, Delta & Pine Land Co., Scott, Miss. Neumann produced 2.5 bales of cotton per acre to win first place award and the King's crown in the 1956 Madison Parish, La., Cotton Contest.

Neumann planted Deltapine 15 cottonseed on his 18.5 acres of land about April 7, 1956. He fertilized his cotton with 80 pounds of nitrogen per acre. Practicing an intensive insect control program, he eventually was able to hold the boll weevil infestation at 15 percent and less.

Arrangements for the banquet to honor the contestants were made by Mrs. Agatha Sevier, manager of the Madison Parish Chamber of Commerce, and Max McDonald, county agent. George Speed, Tallulah businessman, was master of ceremonies.

Production Conference

(Continued from Page 13)

bacterial blight. This is the multifarious abomination called "angular leaf spot" when it gets on cotton leaves, "boll rot" or "boll blight" on the bolls and "black arms" on the stalks and branches.

Probably nobody would care much about a few angular spots on the leaves, if it were not for the fact that an infected leaf soon drops off. Any considerable amount of this untimely defoliation is noticeably depressing to the yield. If there's enough to produce a perceptible litter on the ground at midseason, it can mean as much as 25 percent loss in production.

Infections in the bolls have a different effect. As the circular, water-soaked spots gradually turn brown, the bacteria penetrate into the center of the boll, enmeshing the moist fibers of the lock in yellow bacterial slime. Such a lock at maturity remains a hard wad and does not fluff out naturally as the boll opens. Hand pickers ordinarily leave such diseased locks in the field, but machine strippers bring them in along with the good cotton. The ginning process breaks up the blighted locks and scatters the matted yellow fragments throughout the sample. This causes the classer to add that unpleasant adjective "spotty" to his grade designation, and the bale commands a lower price by virtue of its inferior quality. In some areas in which bacterial blight is of regular occurrence, the rise in the output of spotted cotton has seemed almost to parallel the recent increase in popularity of machine strippers.

• **Other Diseases** — In nematode root knot, Verticillium wilt and Fusarium wilt are diseases which are notorious for preventing growth and fruiting of the cotton plant and for causing premature death. Most of us here are familiar with the way these diseases operate, and we understand all too well the ways in which they bring about unthrifty or dead stalks that produce little or no cotton, with that produced being of poor quality.

Cotton root rot, known outside of Texas as Texas root rot, is caused by a soil-borne fungus native to many soils from East Texas westward to the Pacific Coast. Cotton planted in infested soil first shows the disease when the plants are 12 to 15 inches high. Scattered plants over the field wilt rapidly. From the wilting there is no recovery. Ordinarily each dying plant is followed in death by its neighbors a day or two later, so that the aspect is soon one of expanding spots of dead plants throughout the field. The process continues to frost or harvest, whichever occurs sooner. The sudden dying of individual plants intercepts them throughout the latter two-thirds of the season in all stages of growth and production. A plant killed early produces nothing. One killed the day before frost or harvest bears a full, normal crop. Those killed midway bear various combinations of mature bolls and bollies. So the effects of root rot are on price and volume, both of which may be depressed.

We've noted that all diseases tend to depress the grower's price through lowered quality, and his volume through decreased yield. Although we've mentioned increased cost of production for only one of the entries, the seedling disease complex, it is obvious that added costs are involved in some of the others. For example, think of the extra weed problem in fields where plants make poor growth or are killed outright by wilts or root rot.

How far have we moved along the road toward complete mastery of cotton diseases? We had just as well admit that we lack a good deal in arriving at complete mastery. Much remains to be done—even though fair to excellent control measures have been worked out or are on the way for all the major diseases.

• **Control Measures** — The seedling disease complex can be controlled to a marked extent with seed protectant fungicide. As with most good farming procedures, however, seed treatment is not quite perfect. The acceptable materials give excellent protection against seed decay and reasonably good insurance against dying of the seedlings on the way to the surface. But they often fall short of adequate control of soreshin or post-emergence damping-off, that condition in which the young plants are girdled by decay at the soil line and fall over dead. It is believed that the emerging seedlings outgrow the protected zone around the seed created by the fungicide carried on the seed coat, and that there is need of a way to mix additional fungicide with the soil in a narrow band above the seed.

This idea has been tested in dozens of experiments in all the cotton states during the past five years. Results of such tests have varied from excellent to poor. In certain areas in which the procedure has been consistently effective, growers are already using these in-the-furrow applications on a large scale. In others the research is continuing, with the objective of finding compounds and methods of application appropriate to the full range of soil and climatic conditions under which cotton is grown.

The consistant failure of chemicals to control bacterial blight has caused the major emphasis to be placed on the introduction of genes for resistance into the major Upland varieties. Fortunately, about 10 genes for resistance have been discovered, so there is no lack of sources. The breeding program has been participated in by USDA and state research men in several locations. From New Mexico has come Acala 1517BR; from Texas, Mebane B-1, Blightmaster (a stormproof type) and Austin. In the areas to which they are adapted, these new releases are providing a great measure of relief from bacterial blight. Even more promising is the backlog of lines the breeders have on hand now in various stages of development. We can have confidence that the spectrum of blight-resistant varieties will be broadened a great deal in the near future.

The story of breeding for resistance to Fusarium wilt is an old one. An early group of wilt-resistant varieties, popular in the Twenties and Thirties, was superseded by better types such as Coker 100 and Empire. Now there is a still newer group: Plains, Stonewilt and Auburn 56—which is attracting much interest. Workers in the Eastern States have discovered recently that nematodes have an infection-aiding function in connection with Fusarium wilt of cotton. With this aspect brought to light, the role of nematocides in the manage-

Cotton Yield Reduction by Major Diseases In U.S., 1952 to 1956

The following table summarizes estimated cotton reduction in yield from major diseases for each of the past five seasons. It has been prepared for the Cotton Disease Council by a committee composed of Philip J. Leyendecker, A. L. Smith, W. E. Cooper and Leonard Lett. Detailed information for 1956 losses by states and diseases is available from the committee also.

Diseases	1952* Bales	%	1953 Bales	%	1954 Bales	%	1955 Bales	%	1956 Bales	%	Total Loss Bales	Average Loss Bales	%
SEEDLING DISEASES (Rhizoctonia, etc.)	500,457	3.32	431,473	2.28	460,856	2.91	363,533	2.67	385,033	2.63	2,141,352	428,270	2.76
BACTERIAL BLIGHT (X. malvacearum)	275,760	1.35	240,796	1.27	112,341	.71	222,611	1.08	229,621	1.56	1,081,129	216,226	1.19
ROOT KNOT (Meloidogyne sp.)	188,225	1.32	322,590	1.70	175,479	1.11	164,795	1.35	180,713	1.23	1,031,802	206,360	1.34
VERTICILLIUM WILT (V. albo-atrum)	61,277	.45	399,009	2.10	160,196	1.01	189,168	1.38	194,412	1.33	1,004,062	200,812	1.25
FUSARIUM WILT (F. vasinfectum)	163,518	1.12	256,253	1.36	191,510	1.21	173,883	1.29	171,638	1.17	956,802	191,360	1.23
BOLL ROTS (Rhizopus, etc.)	199,620	1.52	103,842	.55	114,360	.72	322,082	2.75	216,175	1.47	956,079	191,216	1.40
ROOT ROT (P. omnivorum)	137,865	.65	149,627	.79	114,410	.72	164,236	.42	120,726	.82	686,864	137,373	.69
OTHERS	220,681	1.12	67,218	.36	55,246	.36	106,062	.51	64,831	.44	514,038	102,808	.56
TOTAL	1,747,403	10.85	1,970,808	10.41	1,384,398	8.75	1,706,370	11.45	1,563,149	10.65	8,342,128	1,674,425	10.42

* California not included.

Nutrition Meeting To Be Jan. 14-16

Members of the cottonseed crushing industry and others interested in the use of cottonseed feed products are urged by USDA and National Cottonseed Products Association Educational Service to plan on being in New Orleans on Jan. 14-15-16. These are the dates of the fourth Conference on Cottonseed Processing and Nutritive Value of Cottonseed Meal. Sessions will be held at the Southern Regional Research Laboratory, 1100 Robert E. Lee Boulevard. Following presentation of the latest information on cottonseed meal and processing research, special committees will make recommendations for the future.

ment of land devoted to cotton assumes a dual importance.

Root knot is caused by the only group of nematodes which produces a distinctive symptom that can be readily identified by the non-nematologist. Determination of the numerous other cotton-infesting nematodes requires that samples of roots and adjacent soil be submitted to a nematologist, who must process the samples and identify and count the worms present. I believe that all the cotton states now have nematologists on their research staffs, and the USDA has placed several nematologists in the Belt. These workers are very rapidly surveying the cotton lands and building a picture of the prevalence and distribution of the nematodes that affect cotton production. Chemical industry has been extremely active recently in developing an array of compounds that are finding increasing use as soil fumigants for the control of nematodes.

The approach to the control of Verticillium wilt has been through revision of crop production practices and by a breeding selection program aimed at developing resistant varieties. The breeding work is rather new, relative to the programs mentioned before, but there is promise in a number of the advanced lines being brought up at several locations.

The disease that has most nearly defied all approaches to control is cotton root rot. C. J. King found the first ray of hope back in the Thirties at Sacaton, Ariz., when he showed that the incorporation of large quantities of corral manure into the soil gave perfect control. The amounts of manure applied experimentally by King were impossibly large to be available on modern, mechanized farms, so the next step was to develop cropping systems which would produce organic matter for incorporation into the soil by means within reach of the growers. But the past half-dozen years of drouth in the Southwest have resulted in a serious set-back to the employment of this type of control measure, because the total annual rainfall has been barely adequate for the production of the main crop. Many farmers who had been growing winter legumes have not been able to establish them in the fall for several years, and losses from cotton root rot are mounting.

Right now, I think we are probably no more than about half-way along the path to complete mastery of cotton diseases. Ultimately, we hope to arrive at the point where we can plant to a stand and hold every plant through the gauntlet of diseases to the production of its full quality and yield. Then there will be no reductions in price due to diseases, no penalty in volume, and diseases will not increase costs.

We won't ever get there, of course, but we will continue to approach the goal, and the nearer we come, the more efficient will be our production and the stronger the competitive position of American cotton.

Recent Developments To Cope With the Nematode Menace

DR. ELDON J. CAIRNS, Nematologist, Department of Botany and Plant Pathology, API, Auburn.

Two different types of root-parasitic nematodes are found associated with problems in cotton production in various parts of the Cotton Belt. One type is made up of species capable of penetrating deeply into the root tissues. Such nematodes are called internal or endo-parasites. The other type consists of species which feed and conduct their life's activities in the soil at the surface of the roots. Such nematodes rarely penetrate much below surface tissues. These are called external or ecto-parasites.

The best-known example of the endo-parasites is the root-knot nematode. Another good example, also found throughout the Cotton Belt, is the meadow nematode or root-lesion nematode, *Pratylenchus* spp. Nematologists can now readily distinguish several different species in each genus. Occasional failures of resistant varieties and of usually satisfactory rotations in some locations have been due to the existence of different species of root-knot and meadow nematodes.

Another example of an internal parasitic nematode menacing cotton in some localities is called the reniform nematode, *Rotylenchulus reniformis*, because of its kidney-shape. Another internal parasite recently linked with stunting of cotton plants is the lance nematode, *Hoplolaimus sp.*, which has been able to severely damage seedling cotton.

Recognition of external parasitic nematodes as a menace to cotton is another recent development. Because these nematodes do not enter deeply into the root tissues, they are lost when the roots are removed from soil. Therefore, their existence is easily and frequently overlooked. In various locations in the Cotton Belt the following ecto-parasites have been reported found in association with cotton losses: The sting nematode, *Balonolaimus* spp., which is of particular concern in areas of North and South Carolina and Georgia. The stylet or stunt nematode, *Tylenchorhynchus* spp., which evidently occurs in locations across the Cotton Belt as do the spiral nematodes, *Helicotylencus* spp. and *Rotylenchus* spp. Two other external parasites, the stubby root nematode, *Trichodorna* spp., and the dagger nematode, *Xiphinema* spp., are of concern chiefly in the Southeast.

Remember, that of all the nematodes mentioned, only the root-knot nematode can be recognized as being present by the formation of root knots or galls.

• **What Nematodes Do**—Usually, nematode infected plants are not killed. Instead they become weak, poor-yielding plants.

Nematodes cause damage to cotton roots by feeding on the root cells, which are punctured for the removal of the cytoplasmic contents. In the case of the internal parasites, the bodily entry of the nematodes into the roots and the migration within the root tissues also do damage. Growth of individual roots may be stopped so that the extensiveness of the root spread and the plant's foraging capacity in the soil are limited. The net result of having a restricted and impared root system is a reduced and limited ability of the plant to take up and transport sufficient quantities of water and minerals to provide for a vigorous, high yielding plant.

Another aspect of the nematodes' affects on the cotton roots is the possible importance of nematodes in combination with other soil organisms. Plants with wounded and weakened roots are much more easily invaded by decay organisms and by other soil-borne pathogens. The Fusarium wilt-nematode complex is a well-known example of an important fungus and nematode combination.

The development of a really successful Fusarium wilt resistant cotton for use in the lighter soil areas of the Southeast required the development of a root-knot resistant variety. An outstanding example of a variety able to produce well under conditions of root-knot and/or Fusarium infestation is the recently developed Auburn 56 variety. However, under conditions of heavy to severe infestation, the resistance of this and of all the other resistant varieties is overcome to some extent. Considerable promise for acquiring greater resistance to the root-knot nematodes and consequently to Fusarium wilt also, lies in the fact that near immunity to the root-known nematodes exists in some wild cottons

Reports from South Carolina indicate that the ecto-parasitic sting nematode increases the Fusarium wilt incidence in the best wilt resistant varieties. Greenhouse tests in Louisiana, on the other hand, indicate that not all of the parasitic nematodes of cotton are partners in complexes with the Fusarium wilt organism. It is necessary to determine the role of the various nematodes both by themselves and in combination with the other pathogens in addition to screening of the cotton varieties for resistance.

Use of soil nematocides in cotton production is increasing and is expected to become more common. The recent, significant developments in this phase of nematode control are: First, the development of a less phytotoxic nematocide; second, the use of granular carriers for liquid fumigants and new application ideas; third, the introduction of combinations of nematocides.

Nemagon or Fumazone is of very low toxicity to plants at the surprisingly small dosages required for effective nematode control. Use of this material does not require that soil be treated well in advance of planting to avoid subsequent chemical injury to plants. The material can be applied at the time of planting and also after planting as a side-dressing. Thus, soil fumigation

now becomes possible at about the same time or simultaneously with the standard cultural operations.

Another recent development is the finding that the liquid nematocides can be impregnated on solid granular carriers for new ways of application to soil. The fumigants used for this purpose are impregnated on such materials as Attaclay, vermiculite, and granular fertilizers. The significant point is that the granular forms of the fumigants can be applied by the cotton growers using machinery already on hand. Experiments have shown that there are no consistent differences in the effectiveness of the solid carrier forms or the liquid form of the same chemical when applied at comparable rates.

What about the relatively high cost of good application equipment? Granular forms of the fumigants provide one new solution of that problem. Another recent development of note is the introduction of gravity-flow type applicators. The low cost of this type of applicator is due to the elimination of expensive pumps and metering valves.

An interesting recent development is the introduction of nematocides prepared in combination. In some areas of the Southeast it has been found that different kinds of nematodes are more or less resistant to particular nematocides. With this problem in mind, the Dow Chemical Co. is introducing a combination nematocide called Dorlone. This is composed of one part by volume of ethylene dibromide and five parts of 100 percent technical dichloropropene (the main active ingredient of Shell D-D).

The reason for the differences in the effectiveness of these two nematocides against certain nematodes in some localities is not known. Research is needed to settle this question.

Getting a Stand of Vigorous Seedlings at First Planting

DR. ROY L. LOVVORN, Director of Research, North Carolina State College, Raleigh.

Good stands of vigorous seedlings must start with seed whose life has been preserved at a high natural level from the time of their development till they are planted.

Seed life is normally at its highest possible level when a cotton boll first opens; immediately thereafter, that life starts to weaken. The rate of weakening may proceed slowly or rapidly, depending mainly upon the moisture and temperature levels existing within the seed. Continuous dry weather while the seeds are exposed in the field is known to be highly beneficial in preserving seed vigor. But even under the most favorable weather conditions, especially in the Southeast, the rate of deterioration is such that a seed crop should be removed from the field with only a minimum of exposure to weather conditions. Emphasis should be placed upon dryness of the seed at time of harvesting, especially if the seed will have very little opportunity to dry out before ginning.

• **Harvesting** — Mechanical harvesting as now practiced, is certainly not favorable to the production of seed of the highest possible vigor. Futhermore, the bulking and handling of large quantities of moist seed, which at best receive only a minimum of needed attention, is certainly not conducive to the preservation of a type of seed life that possesses the desirable strength to give good stands of vigorous plants under a wide range of planting conditions.

When damp cotton is lint-dried to permit ginning, the soft non-dried seed becomes gashed and bruised: Injuries of this type are known to accelerate seed weakening and death. Such injured seed are very susceptible to soil-borne organisms. Seed life is further weakened while being conveyed by air from gins into storage houses. Moist seed are bruised, and excessively-dry seed fractured, by excessive amounts of rough handling while being conveyed.

• **Planting** — Planter and planting method tests at this station have shown that no one best method of planting exists for all of the diverse soil and weather conditions that occur. Also, it has been observed that planting in accordance with experiment station recommendations does not necessarily result in acceptable germination.

Actually, planting is still looked upon more as an art than a science. All states recommend selection of good seed, planting to "proper" depth, covering of seed and pressing to a "proper" degree of compaction. And the term proper implies that there is a best depth and a best compaction. But these are usually left up to the judgment of the operator as to just what is proper under given conditions.

The effects upon germination of such factors as temperature, moisture, seedbed compaction and depth of planting have not been quantitatively studied in terms of developing planting equipment. It is not easy to measure precisely the soil oxygen, carbon dioxide, water and temperature and to relate them to soil compaction as brought about by planter operations. But it is the engineers' hope that within another two years, the instrumentation will be complete enough to begin evaluation of the methods of soil modification and possibly the development of improved planting techniques and machinery.

• **Fertilizer Injuries** — Research and experience emphasize the importance of side placement of fertilizers. Row application of fertilizers, unless well mixed

Editorial

INSECT FIGHT CALLS FOR INCREASED EFFORTS

RESISTANCE OF INSECTS to many of the poisons that have been widely used was a major topic of discussion at the recent Cotton Production Conference in Birmingham. It has been widely discussed elsewhere during the past season. There is no doubt that resistance exists in some areas. It is a matter for serious concern, but it certainly is not a cause for panic.

Ginners, cottonseed crushers and other readers of The Press can render service to the industry by understanding the situation and helping others to know what to do about it.

• **Where Do We Stand?** — The preliminary Conference Report issued after the Birmingham meeting summarizes the present situation. It points out that resistance among cotton pests was first demonstrated by the leafworm in 1953. Since then a number of other pests have shown varying amounts of resistance to certain pesticides. Greatest cause for concern has been the development of boll weevil resistance to the chlorinated hydrocarbon insecticides the past two seasons. This has been chiefly in Louisiana, but also has been found in parts of Mississippi, Arkansas, Texas and South Carolina.

Resistance, therefore, still is restricted to a very small portion of the Cotton Belt as a whole.

• **What Should We Do?** — Where resistance has been proved, cotton producers should check carefully with local authorities as to whether or not to use the chlorinated hydrocarbons. In such areas, it is doubly important to check and check again with reliable authorities as to poisoning methods in 1957.

Growers everywhere during the coming season should make sure that they use all of the recommended practices that will help to reduce cotton insect damage. One of these is early season poisoning. Many well-informed, practical men in the cotton industry feel that early poisoning, properly done, will check the boll weevil and other pests so that resistance to insecticides will not become an economic factor, even if some resistance does develop later in the season. Therefore, early season control should be given most careful consideration in 1957.

Stalk destruction is another practice that deserves wider attention than it has ever had in the past. Stalk destruction has proved its value in reducing overwintering populations of weevils and in curtailing pink bollworms in many areas. It has proved beneficial to the soil. The only thing wrong with stalk destruction is that there hasn't been enough of it. There should be far more during 1957.

These practices and others need to be urged upon every cotton producer during the coming season. Planting time is a long way off for some areas, almost at hand for others. But it is none too soon for ginners, crushers and producers to be making plans to increase efforts for insect control in 1957. It is essential to save every pound of lint and seed that can be saved from pests on the acres that are not taken out of production by the Soil Bank.

in the soil, frequently causes abnormal or dead seedlings. Many seedlings become taproot-less because of fertilizer injuries. Nitrogen applied at the rate of 18 pounds per acre within the seed row has been found to reduce cotton stands by 42 to 72 percent, depending upon the preceding crop.

• **Seedling Diseases** — Seedling diseases are a Beltwide problem in obtaining a good, vigorous stand of cotton. These diseases are of two types, those caused by pathogens which are seed borne, and those caused by soil inhabiting organisms. By far the most important disease of the seed borne type is anthracnose, which is carried primarily on the lint left on the seed.

Before chemical treatments were available, control measures consisted of planting two-year-old seed or heating the seed to approximately the same temperature as boiling water. Fungicidal control is now more popular.

Seedling disease organisms that live in the soil cause their greatest damage during conditions unfavorable for seed germination or seedling development. Cool soil temperatures with higher air temperatures cause high water losses in the young cotton plant and thus favor attacks by these organisms.

Extensive studies by the Cotton Seedling Disease Committee have found the organic mercurial compounds effective in controlling anthracnose and offering some protection from the soil borne types. However, under conditions very unfavorable for seedling emergence and development, none of the presently used seed treatment materials is adequate.

• **New Fungicides Promising** — In more recent years, varying degrees of success have been experienced in controlling the soil borne diseases by direct application into the row of some of the newer fungicides. More work is needed, however, before a safe, general recommendation can be made.

Much progress has been made in the use of chemicals for seedling diseases, but under our most adverse conditions we still have disease troubles. Thus more work must be done by the plant pathologist, working in cooperation with the plant physiologist, the agronomist and the agricultural engineer. We believe that a newer approach has been made by the engineers in developing procedures for designing better planters. This work will take time, resources, and the cooperation of the other disciplines, but I am confident it will pay dividends. We still have too much art and too little science in obtaining cotton stands.

Promising Herbicides For Weed Control

DR. JOHN T. HOLSTUN, JR., Agronomist, USDA, Delta Station, Stoneville, Miss.

In this report, herbicides and methods of weed control are classified as preplanting, pre-emergence, or post-emergence in relation to the cotton.

• **Pre-Planting Herbicides** — The use of herbicides prior to planting cotton can include fall treatment of perennial vines with hormone-type chemicals, soil fumigants to kill weed seed, contact sprays to kill emerged weeds, soil treatment with residual systemics, and application of systemic phytotoxins to emerged perennials. Of these, only the last has received appreciable research attention.

Pre-planting treatments can be applied during relatively slack work periods, permit easy use of soil incorporation techniques, and in some cases are less likely to injure the crop as compared to post-planting techniques. On the other hand, longer control is required, band treatments are difficult or impossible, they cannot be withheld in weed-free seasons, and selectivity by differential placement is at least partially eliminated.

No pre-planting herbicides are generally recommended at the present time. In Texas, however, recommendations have been made for the limited use of maleic hydrazide, TCA, and dalapon under certain conditions for the preplanting control of Johnson grass.

Several workers have obtained favorable results, with some serious exceptions, in the control of Johnson grass by a pre-planting application of dalapon to emerged plants at rates of five to 20 pounds per acre. Broadcast, spot, and band treatments have all been used. Injury to the cotton is avoided through biological decomposition and leaching of the dalapon prior to planting of the cotton or by planting techniques which reduce the contact of the cotton seedlings with toxic concentrations of the herbicide. Serious damage to cotton occurred in one location where no rain fell between application of the herbicide and planting of the cotton; it is not known whether a different planting technique

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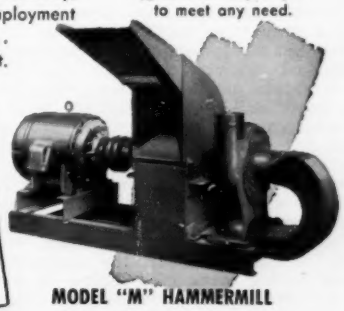

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would have prevented this or not. The effectiveness of the control is enhanced by conditions favoring early emergence and rapid growth of the Johnson grass.

In Texas maleic hydrazide has also given favorable results in controlling Johnson grass when used in a manner similar to that descirbed above for dalapon.

• **Pre-Emergence Herbicides** — Pre-emergence herbicides are residual phytotoxins applied after the cotton is planted and before it emerges. Usually, but not necessarily, they are applied by a sprayer mounted on the planting tractor. At present, band treatments to about one-third of the row are considered more practical than broadcast applications. The present cost range for band treatments is about two to five dollars per acre, and the reasonably certain returns are three- to six-weeks control of annual weeds.

Since pre-emergence herbicides can be applied as the cotton is planted, adverse weather need not prevent their timely application. The application equipment is simple. The requirements of seedbed preparation and cultivation of the crop after emergence are less rigorous than those for current post-emergence herbicides. On the other hand they are dependent on soil moisture for activation, cannot be withheld in the event of weed-free seasons, cannot be re-applied as needed, and may be lost in the event of stand failure.

CIPC and diuron are the only pre-emergence herbicides widely recommend ed at the present time. Their recommendation and use is largely confined to the Southeastern States where early-season annual weed infestations are a major problem.

Both of these are residual systemic herbicides that kill as a result of their absorption from the soil by emerging weeds. Soil-surface moisture and early germination of the weed seed are essential for best results. Selectivity is primarily the result of planting the cotton at depths of one-half to two inches below the surface and application of the herbicides to the soil surface.

CIPC and diuron are not very water soluble, nor do they leach readily. CIPC is slightly more water soluble than diuron and considerably more volatile. Diuron is more persistent than CIPC and thus gives weed control a greater duration, but also presents more problems in residual toxicity. Neither herbicide is considered dangerous from the standpoint of accumulative toxicity from repeated usage if band application, recommended rates, and certain other limitations are followed. CIPC has been reported to give better control under conditions of low surface moisture, possibly because of its greater solubility in water. Both work well on most annual weeds that germinate near the soil-surface, and neither gives good control of weeds that germinate from lower depths. Neither controls perennials except those germinating from seed near the surface. In general CIPC appears to have a slightly wider safety margin in relation to cotton injury but gives slightly less weed control.

No new herbicides have been reported as unquestionably superior to CIPC or diuron as pre-emergence herbicides for cotton. Acceptable results have been obtained with CDT at rates of six to 18 pounds per acre. Under some field conditions it has caused considerable chlorosis in cotton, and some injury by volatilization under greenhouse conditions.

A related compound, CET, has given good weed control at one to four pounds per acre, but cotton injury was excessive. It should probably be investigated for use on older cotton and for treatment of the row middles at lay-by time.

In preliminary field trials two other materials gave equal weed control and less cotton injury than CIPC at a lower rate. These compounds are less volatile than CIPC and the possibility of safer control with greater duration should receive further research consideration.

• **Post-emergence Weed Control**—Post-emergence weed control is more complicated than the two previous classifications in that herbicides, flame, cultivation, cross-cultivation, and hoeing are all included.

The herbicides may be further classified as directional sprays for the drill area, sprays for the middles at lay-by time and chemicals for spot-treatments. The drill area herbicides now recommended include the contact-action herbicidal oils and several residual systemics. Only certain residual systemics are recommended for lay-by treatment of the middles. Herbicides recommended for spot-treatment include TCA, dalapon, contact oils, and fortified oils.

Directed sprays of post-emergence oils for drill-area weed control are recommended only for early-season application where annual weeds emerge with or soon after the cotton. The contact action of the oils is relatively free from effects by environmental factors, if these factors do not prevent its timely application to weeds less than three inches high. Seedling cotton is very resistant to these oils, but tends to become more susceptible at the stage of true-bark formation. Also by this time the shoulders of the drill area where the applicators run tend to become too rough for accurate placement of the oils due to the accumulative effects of several cultivations. Should viable weed seed fail to germinate prior to the last safe oil application they constitute a potential late-season weed infestation. In the humid areas, however, most of the weed seed do germinate early in the season and cheap, effective, and safe seasonal control is often obtained with these oils. Pigweed, crabgrass and other similar plants are effectively controlled, and sometimes partial control is obtained in light infestations of perennial weeds. Farm usage of these oils has been largely restricted to certain areas of Texas and the Midsouth. In the Far West early season weeds are seldom a major problem. Sources of supply for the oils have limited their use in other areas as well as the impracticality of maintaining the specialized application equipment on farms with small cotton acreages. Even in the areas of greatest use the oils have been used on only a small fraction of the total acreage. Here, the limiting factors are primarily the requirements for uniform seedbeds and the complexity of coupling accurate spray placement with effective cultivation of the unsprayed middles.

In the Far West considerable use is now being made of directed sprays of several residual systemic herbicides for both mid-season and lay-by control of annual weeds in irrigated cotton. In these cases the herbicide may be applied to both the drill areas and the middles. Although the application is post-emergence in relation to the cotton, it is pre-emergence to the weeds. The herbicidal action is primarily the result of absorption of the herbicide by the weeds from the soil, and therefore, appreciable soil moisture is required for effectiveness. Lack of adequate soil moisture after application has been a discouraging factor in the rainbelt teasts, but the expansion of irrigation into this section or seasons with adequate rainfall may encourage further studies of this type.

In Arizona and New Mexico, NPA has been at least partially effective as a directed spray for control of annual grasses. In some cases, however, yields have been adversely affected. Two substituted ureas, monuron and diuron, have given good results when used in a like way for morning glory control, but further work is needed on the residual toxicity of these two materials. Granular formulations of these herbicides are now being studied in an attempt to simplify the application problem.

Spot-application with contact-action herbicidal oils and fortified oils, and with the systemic herbicide dalapon, is generally recommended on at least a trial basis for the control of scattered infestations of Johnson grass. Where the contact oils are used, only the crown of the grass need be wet, but with dalapon complete coverage of the aerial portion is desirable. Fewer retreatments are required with dalapon than with the contact oils. Either type of herbicide may be applied with compressed air hand sprayers or with hand-spray lines attached to a tractor-sprayer.

Few promising new herbicides have been found for post-emergence use in cotton, but there are several that may prove helpful in alleviating one or more problems.

In preliminary evaluation tests several oils of a low degree of phytotoxicity (such as mineral seal oil) applied as directed sprays to the drill area of young cotton, suppressed grass growth without apparent injury to the cotton. The nature of the action appeared to be systemic, and while the control was not spectacular the safety margin appeared to be wide. Possible advantages over current recommended herbicides would

Cotton Congress To Change Program

The eighteenth annual American Cotton Congress will be different from the previous meetings sponsored by the Statewide Cotton Committee of Texas and cooperating organizations. There will be a general meeting of not more than one and one-half days at Dallas in early June, featuring key speakers. There will be one-day meetings at Sugarland, in Southeast Texas, later in June; and a meeting at Pecos, in West Texas, probably in August. Preliminary plans for these meetings were made Dec. 17 at a committee meeting in Dallas, and definite plans and dates will be announced later. Cotton production problems will be discussed at the area meetings, designed primarily for producers of the region. A third area meeting may be held at Lubbock.

be simpler application equipment, usage on cotton of any age, and lessened requirements for precision in rates and placement made possible by the wide margin of safety.

Band applications of CDT in water or in "non-phytotoxic" oil at broadcast rates of six to 12 pounds per acre have given good control of small annual weeds. Cotton reaction varied from none to temporary chlorosis. The action appeared to be contact and systemic through absorption by the aerial parts of the weeds with a possibility of some residual effect through the soil. It is likely that soil moisture, rainfall, temperature and the stage of cotton growth at time of application will all effect the results obtained with this herbicide. Possible advantages over current herbicides include less dependence on soil moisture for effectiveness (does not apply to the contact-action oils), the chance of greater selectivity, and perhaps control of greater duration. Both early-season and residual lay-by weed control appear possible with this herbicide if it proves to be safe in relation to the cotton.

Several wetting agents, an alkyl polyether alcohol, two polyoxyethylene ethers, and a polyoxyethylene thioether gave marginal weed control by contact action where applied as two to four percent concentrations as directed sprays to the drill area of young cotton. Cotton injury was slight, and pigweeds were more effectively controlled than grasses. Possible advantages include simple application equipment, low equipment, low shipping cost, and ready availability. Their chief disadvantage gree of weed control.

Post-emergence flame is the only practice given a beltwide recommendation for weed control use during the mid- and late-season growth of the cotwould probably be in the reduced deton. It is most effectively used to maintain, rather than establish, good weed control. Flaming equipment is expensive, but is fairly easy to use and present designs are relatively free of defects.

Recent developments in flame for weed control include the development of fenders and high clearance machines that may aid in its use in rank-growth cotton and the development of experimental minature burners for use in small cotton. In Mississippi these small burners were used to get satisfactory weed control without appreciable crop injury in cotton as small as three inches in height.

In fields where water erosion is not a serious factor, cross-cultivation has proved to be an effective way of reducing the labor required for weed control.

Cultivation is still the cheapest method of weed control in the middles. Where herbicides and flame are used, some modification of the usual technique of middle cultivation is needed. It should be done in such a way that untreated soil from the middles is not moved into the treated drill areas where it might be a source of viable weed seed and interfere with the correct placement of herbicidal oils and flame.

All present day weed control programs include some use of hand weeding by hoeing. Where hoe labor is available in quantity at 30 cents per hour it is still an economically competitive method of weed control, particularly in seasons of light weed infestations. This wage rate is not comparable with that required for a decent standard of living, and cannot be expected to exist for much longer. Unfortunately, however, it is about as high as can be paid for the quantity and quality of the work. Where large crews are hired by the day there is a decided tendency for an entire hoeing crew to move at the rate of its slowest member and frequently as much time is spent in flat-weeding relatively clean fields as in hoeing out moderately heavy weed infestations. Research is needed on the problem of how to control the reduced weed infestations frequently obtained by chemical and mechanical means. Some farm operators have reported moderate success with incentive-pay systems, but the problem is a difficult one to approach from the research standpoint.

Low-Cost Weed Control

W. G. WESTMORELAND, Weed Control Specialist, North Carolina Extension Service, Raleigh.

A low-cost system of weed control on one farm may turn out to be high-cost weed control on another farm. No one set of standard practices will work out to the advantage of all cotton growers. Since this is so, let's look at a few possible combinations which are working under more-or-less typical kinds of farming conditions.

Farmer A is working five acres of cotton in addition to his other enterprises. He uses his tractor for planting and cultivating and his family labor—a wife and three children—for hoeing and hand harvesting. Custom pre-emergence ap-

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plication and custom machine picking have not been satisfactory for him. For him to change his program, it seems he must be offered some simple, cheap treatment or system which must have some application in other areas of production on his farm.

Farmer B has 20 acres of cotton and it is one of his major enterprises. All crops are handled with tractors and cultivation usually presents no problem. In addition to two sons of high school age, he has a tenant family which furnishes five field hands for hoeing and picking. A portion of this cotton acreage is handled entirely by the tenant. At times it is necessary to hire labor for both chopping and picking. This farmer is also looking for a means of reducing the per unit cost of production but questions the advisability of investing in herbicides and a cotton picker. Mechanizing could cause the loss of his tenant family which furnishes necessary labor on other enterprises.

Farmer C, a neighbor of Farmer B, has attempted to mechanize his 25 acres of cotton. He is hampered by small fields. Pre-emergence chemicals are doing a resonably good job on early weeds, but weeds in the cotton at harvest time cut the efficiency of his picker and lower the grade of his cotton. Under present conditions, his equipment continues to depreciate and his efficiency suffers since he could easily operate twice as many acres. He is in about the same position as Farmer B except he is not as dependent upon an uncertain labor cost and supply.

Farmer D is operating over 100 acres of cotton. Although he is almost completely mechanized, he has some land on which a pre-emergence chemical does not do a good job because of the kind of soil and species of weeds. This is being handled with a rotary hoe and hand labor. His weed co.trol program is to plant and use a band treatment of a pre-emergence chemical. This has saved two cultivations and several hours of hoe labor per acre to have cotton clean at about six to eight weeks after planting. This does not eliminate hand hoeing completely but curtails it drastically. He has tried "oiling" but was not able to control the material sufficiently to prevent injury to the cotton. His major problem now is annual grass which grows between the last cultivation and picking time. The problem can be severe and, in his case, depends mainly on rainfall and temperature conditions. And too, he has succeeded in getting a high degree of control of "patches" of Johnson grass and Bermuda grass by using spot treatments of oil or dalapon. His yield has not been seriously hurt since he had made very little in the "patches."

• **Apply Program to Needs** — There are many producers growing 200 or more acres. These producers readily accept information about new practices and combinations of practices. As a rule the combination of weed control practices used by them fits their conditions. They are practically forced to use those production factors which are of the greatest advantage because they (1) are competing with industry for labor, (2) must be paid for managerial ability, and (3) must have a fair return on monies invested.

In each case the grower has set up a general program which can undergo minor shifts and changes. Each has thought through his problems and tried different practices. And he has probably assembled the combination of practices which best suit him.

Here are some of the questions each farmer must ask himself in working out a one-cost weed control program for his operation:

1. Does he have a constant, dependable supply of labor?
2. Is his labor controlling weeds through cultivations and hoeing? Is it efficient?
3. If workers are capable and willing, could they learn jobs which might increase the efficiency of cotton production and expand farm enterprise?
4. Has the farmer really tried newer tools such as the rotary hoe, chemicals, oil, etc?
5. Has he tried to fit newer practices into his program after learning to use them?

Successful combinations of weed control practices must fit the problems of the individual case. These combinations can seldom be transferred.

It is generally agreed that, in most cases, cultivation and hoeing is the only way to handle weeds in 15 or less acres of cotton. If cotton comprises 20 or more acres, there is a good possibility of increasing efficiency in weed control by using a pre-emergence chemical with the necessary hoeing and cultivation for a clean crop at the last working. Present experience in the Southeastern States does not point to a practical treatment for cotton "clean of weeds" at harvest.

A Farmer's Experience With Weed Control

HARRISON EVANS, Shuqualak, Miss.

Our first experience with DNBP and Lion Herbicidal Oil made us realize the possibilities of chemicals for the pre- and post-emergence control of grasses. When DNBP was used on a properly prepared seed bed, under favorable temperature conditions and on certain type soils, the results were most satisfactory.

The success in the use of oils depends upon applying the oil at the exact right stage of growth of the weed, that is to say, young and small. Under these conditions weeds in the drill can be controlled until the cotton plant is large enough to flame.

During the past several years we have used CIPC as a pre-emergence herbicide on practically all of our cotton acreage. Grass was controlled reasonably well for four to six weeks. This permitted us to reduce the number of hoe hands and still make a good yield of cotton. The herbicides have been used to stagger the peak labor load during

Photos Courtesy "Foreign Agriculture"

Japan's Cotton Maid

NATSUMI OHNO, crowned last spring as "Miss Cotton of Japan," is shown in the smaller picture, while the larger shows a Tokyo department store's parade of mannequins during Japan's Cotton Week. The promotion, sponsored by Japan Cotton Promotion Institute with the aid of the National Cotton Council of America and USDA, boosted sales of cotton textiles some 20 percent within a few months. Department stores in 12 major cities featured Cotton Week in advertising, store windows and other promotional efforts. The week was the beginning of a year-round project, partly financed with PL 480 funds, "Foreign Agriculture" points out. USDA and the National Cotton Council are cooperating also with cotton organizations in Europe in promoting increased cotton consumption by using PL 480 funds, supplemented with money provided by organizations in those countries.

chopping time. By the use of herbicides we have been able to broaden this hoe period from two to four weeks.

• **Save in Hand Labor Hours** — In 1956 on our Delta cotton acreage, we used approximately two pounds of CIPC per acre. The hours per acre required for hand hoeing were as follows: May eight, June 12, July 12, August nine—a total of 41 hours. By employing cross-plowing the hand labor hours per acre were reduced to less than 20 on 100 acres of cotton on this farm. On the 309 acres nearly 600 bales have been machine harvested. No reduction in grade was due to grass.

At Shuqualak all of our crop was pre-emerged with either CIPC or Diuron. Both materials gave good results. A total of 42 hoe labor hours per acre was required for this cotton, with 20 hours of this being in June. The difference in distribution of hand labor hours on the two operations was due to the weather.

A flame cultivator was used two to three times on practically all of the cotton acreage.

• **Adapt Methods to Conditions** — On a farm operation it is necessary to adjust modern weed control methods to conditions as they develop since so much depends on the weather, and the size of the operation. With this in mind we have made the following plans for 1957, which will be changed as conditions warrant.

1. All cotton acreage will be pre-emerged.
2. Adequate equipment will be ready for post-emergence application of herbicidal oil.
3. Flame cultivation will be used as much as possible.
4. Mechanical weed control methods will be used as much as possible since they are more economical.
5. All acreage that is suitable will be cross-plowed.
6. Hand labor will be used to keep the fields clean so that machines can be used to harvest the crop.
7. Promising experimental results with chemicals will be tried on a limited acreage, such as post application of CIPC, Diuron and Dalapon, and complete coverage of pre- or post-emergence herbicides.

It is hoped that by applying the above practices, the cost will be down to $10 per acre for drill control of grasses and weeds.

Basic Research for Control Of Weeds Tomorrow

DR. W. C. SHAW, Agronomist, Weed Investigations Section, Agricultural Research Service, USDA, Beltsville, Md.

None of us would attempt to predict what new discoveries might develop in weed control from intensive fundamental weed control research involving the fields of chemistry, biochemistry, plant physiology, genetics, crop and soil science, and agricultural engineering. We can be certain, however, that unless fundamental and applied studies are brought into better balance in the immediate future, applied studies and the development of weed control practices in cotton will suffer.

• **Research for Selective Herbicides** — Basically, our problem in weed control in cotton involves fundamental physiological differences between the crop and the weeds to be controlled. Animals and plants are sufficiently different so that scientists have found a wealth of chemical compounds that may be used to kill insects without killing the plants they infest.

On the other hand, weed research scientists are trying to develop selective chemical methods of controlling weeds which may be very similar physiologically to the crops they infest. It would appear that our margins of selectivity for the development of selective herbicides are very narrow in comparison to the margins of safety and selectivity enjoyed by other plant scientists conducting research with pesticidal chemicals.

Selective weed control is usually affected by a large number of different factors. However, I would like to limit my discussion to just three of these factors.

• **Herbicidal Properties Affect Control** —Selectivity in the control of weeds in cotton as influenced by the physical properties of chemicals may be demonstrated by reviewing the research and development of the N-phenylcarbamates for weed control in cotton.

Research with IPC soon after its discovery demonstrated that this compound, applied as a pre-emergence spray, would control many annual grasses and some broadleafed weeds with little or no injury to cotton. Further studies revealed that its performance was greatly affected by environmental conditions. As a result, IPC generally was erratic in performance, and weed control with the chemical was inconsistent. Neverless, the tolerance of cotton to IPC stimulated interest in this group of compounds and CIPC was subsequently introduced. This herbicide applied as a pre-emergence spray was much more effective than IPC and much less erratic in performance. However, injury to cotton from CIPC has occurred on the lightest textured soils. In studying a large group of closely related N-phenylcarbamates, it was found that IPC and CIPC were highly volatile. When CIPC was applied as a pre-emergence spray to moist soils and high soil temperatures followed the application, the compound would volatilize from the soil surface. The rate of evaporation under high temperatures was great enough to seriously reduce the residual effectiveness of the herbicide. Moreover, under greenhouse conditions the vapors penetrated composted greenhouse soils to depths of two to three inches and caused injury to germinating cotton. The volatility of CIPC reduces its effectiveness as a residual pre-emergence herbicide and increases the chance of injury to cotton especially when grown on light textured soils. Several closely related carbamates including BCPA, CPPC, and CEPC were found to be less volatile, and less likely to cause injury to germinating and emerging seedlings under high temperature conditions. Preliminary studies on the movement of the new carbamates in soils indicate that they are less leachable than IPC or CIPC. Their low volatility and reduced leachability makes it possible for the compounds to remain in the surface of the soil, minimizing the chances of injury to crop seeds which germinate from greater depths. The new carbamates are 10 to 20 percent less active than CIPC but they are 70 to 80 percent less volatile, and are much less likely to cause injury to germinating crop seeds than CIPC.

• **Soil Properties Influence Action** — Progress is also being made in developing fundamental information on the effects of various soil properties on the selective action of herbicides. Fundamental studies have shown that herbicides may (1) be absorbed by soil particles, (2) be leached through and past the root zones, (3) be decomposed by soil - micro - organisms, (4) volatilize from soil surfaces and be dissipated in the vapor state and (5) be inactivated by light or as a result of chemical reactions in the soil.

In a medium so complex as soil, it is extremely difficult to summarize the effects of the many soil properties on the activity of herbicides. In general, the highest activity per unit of herbicide applied pre-emergence is obtained on a sandy soil low in organic matter, with a low pH and a high moisture content. The lowest activity per unit of herbicide applied pre-emergence on a sandy soil occurs on a sand high in organic matter with a high pH and low moisture content. The lowest activity per unit of herbicide applied pre-emergence is obtained on a clay soil high in organic matter, with a high pH and a low moisture content. The highest activity per unit of herbicide applied pre-emergence on a clay soil occurs on a clay low in organic matter, with a low pH and a high moisture content. Exceptions to these generalizations are known to exist. For instance pH is known to have little or no influence per se on the activity of some herbicides. Herbicidal activity as influenced by soil properties is greatly altered when volatile herbicides are considered. The volatilization of herbicides as influenced by temperature is one of the few single

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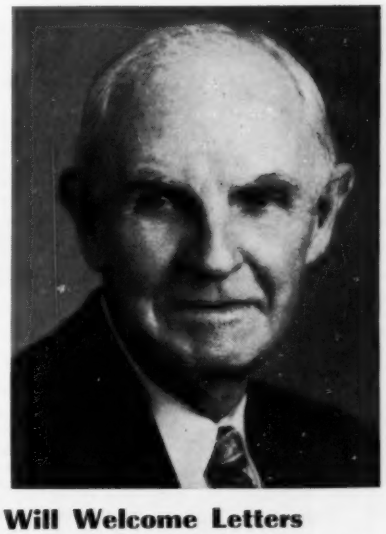

Will Welcome Letters

T. R. CAIN, retired executive of the Alabama-Florida Cottonseed Products Association, now stays at Dunn's Rest Home, Selma, Ala., and is confined to a wheel chair. He enjoys hearing from his many friends in the cotton industry.

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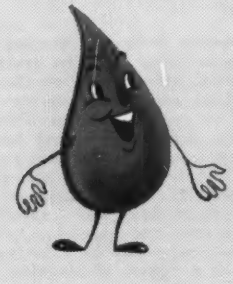

Seed Processors tell us that one of the big advantages in switching to PANOGEN is that PANOGEN, INC., through its Distributors, provides a *single source* for all their seed treating needs. That's because PANOGEN is the largest single supplier of liquid seed disinfectants, treating equipment, and useful attachments.

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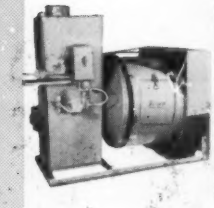
DRINOX: Highly effective in protecting newly planted seed and young seedlings from attack by wireworms, seed corn maggots, and other soil-dwelling insects. Contains *aldrin,* and gives protection without injury to seed germination. Use on wheat, oats, barley, rye, cotton, corn, and sorghum.

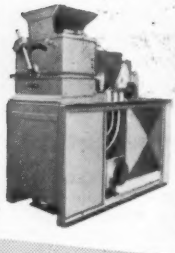
PANORAM 75: For treating corn, rice, sorghum, soybeans, legumes, and vegetables for which *thiram* protectants are recommended. Increases stands and improves yields by protecting from seed and soil-borne diseases causing seed decay, damping-off, seedling blight, and root rot. Includes insecticide for protection of seed from storage insects. This wettable powder stays in suspension for a long time without settling.

PANORAM D-31: A similar formulation but also includes *dieldrin* to protect seed from wireworms, seed corn maggots and certain other insects.

SEED TREATERS

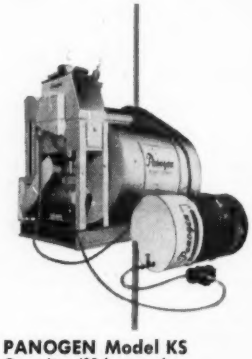


PANOGEN Model JS
Capacity: 150 bu. per hr.
This smaller treater offers "big-treater" performance. Ideal for elevators and seed houses where big capacity isn't required. Offers same accurate, fully automatic, push-button performance as larger models. Equipped with exhaust fan, motor, diaphragm pump. Ready for immediate operation. Shipping weight, 330 lbs.



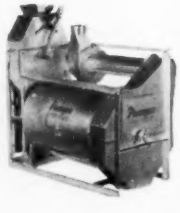
MIST-O-MATIC (3 Models)
Capacity: to 400 bu. per hr.
The new "Triple Treat" and other mist-type treaters developed and manufactured by Ben Gustafson & Son, present a new method of seed disinfectant application by the spray method.

This "atomizing" process of seed treatment gives uniform coverage of seed and fully automatic treating.

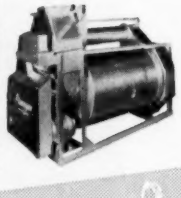


PANOGEN Model KS
Capacity: 400 bu. per hr.
Just connect shipping container of liquid PANOGEN to the KS and you are ready to treat 400 or more bushels per hour. Complete with centrifugal or diaphragm pump and all accessories, ready to operate. Liquid PANOGEN is pumped directly to treater, automatically measured to exact proportions. There's no measuring or mixing, no water to add. Shipping wt., approx. 500 lbs.

PANOGEN COTTONSEED TREATER *Capacity: Up to 8 tons cottonseed per hr.*
Completely automatic liquid seed treater designed especially for high volume push-button treating of cottonseed. Fullflight auger permits full day's run without clogging. Handles four delinting stands easily. Uniform coverage of seed. When used with small grain, will treat 600 bu. per hour. Shipping weight (crated), 700 lbs.



PANOGEN Model US
Capacity: 600 bu. per hr.
Heavy duty machine designed for large capacity, direct treating in grain elevators and seed houses. Accurate dosages with gravity feed automatic scale easily adjusted for exact amount of liquid PANOGEN. Complete for fully automatic treating... no handling of disinfectant, no water to add. Shipping weight (crated), 660 lbs.



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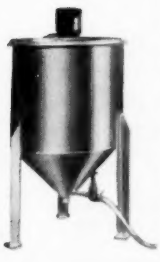
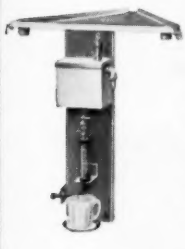
ATTACHMENTS AND ACCESSORIES



DUAL RESERVOIRS permit two different seed treating chemicals to be applied simultaneously without mixing before they reach the seed. Reservoirs can also be used individually when a single material is applied alone. For example, when changing from beans to wheat, operator can switch instantly from slurry to liquid treatment without stopping for clean-out.

SLURRY ADAPTER. Automatically mixes powder disinfectant and water. Power for mixing is supplied by an electric motor mounted on the tank cover. The mixture is delivered to the treater reservoir by centrifugal pump. Once installed, it's easy to quickly change from slurry treating to liquid treating. Can handle up to 600 bushels per hour, depending on treater.



DUST-TO-PANOGEN CONVERSION KIT. Permits instant changeover of dust treaters to ready-mixed liquid treating. Dosages are easily regulated so none of the seed treating chemical is wasted. Meters liquid PANOGEN into dust treater from a drum. Float valve maintains constant pressure on the orifice of a small needle valve for accurate metering of PANOGEN. Overflow attachment avoids loss of liquid if mechanical failure occurs. This inexpensive kit has everything you need to convert your present dust treater to PANOGEN liquid operation.

FUME EVACUATOR. Easy-to-install kit includes adapter, tapered reducer pipe and big 500 cubic-feet-per-minute wall fan driven by powerful electric motor. Draws fumes out of dust and slurry treaters.

CENTRIFUGAL PUMPS. Pumping unit delivers liquids to treater reservoir from shipping containers. Permits placement of treater at high elevations. Consists of a centrifugal pump type D-11 mounted on a ⅛ HP, 110 volt, 60 cycle, single-phase electric motor. Complete with hose and accessories.

DIAPHRAGM PUMP. Mounts directly on the treater. Draws PANOGEN from the shipping container and delivers it to the reservoir for metering. Pumps can be attached to portable units to convert the dust or slurry treater to PANOGEN treating.

APPLICATOR FOR HOME TREATING. Plastic applicator measures out correct dosage of liquid PANOGEN for on-the-farm-use with auger, cement, shovel, or drum mixers. Applicator attaches to PANOGEN bottle for instant use.

AND, CUSTOMERS, TOO

PANOGEN'S national advertising tells your customers about PANOGEN benefits. It tells them why, how, and when to *Panogenize* their seed. It directs them to custom treaters like yourself, who can do the job economically and quickly.

This national advertising is backed up with a kit of dealer materials with which you can reinforce the national advertising in your locality. For example...

SIGNS AND POSTERS. Weather and dust resistant metal signs for outdoor use. Plastic and paper signs and posters for window and indoor use. Reminds your customers that you *Panogenize* seed.

AD MATS AND CUTS. Use in your local newspaper. Invite customers to bring their seed in to be *Panogenized* and cleaned. Complete ads of various sizes, plus cuts you can use for designing your own ads.

RADIO COMMERCIALS. Several 20-second and 1 minute commercials available for use on your local station.

ENVELOPE STUFFERS AND HANDOUT LITERATURE. Choice of several attractive pieces which explain why it pays to have seed *Panogenized*. Enclose with your letter or statements... or hand them out over the counter.

APPOINTMENT CARDS. Use these mailing cards to invite farmers to make an appointment with you for cleaning and *Panogenizing*. Attractive, powerful way to gain new customers, remind the old ones.

For more complete information on material, equipment or dealer advertising aids, contact your nearest PANOGEN Distributor.

Panogen® INC.

RINGWOOD, ILLINOIS

SEED TREATING EQUIPMENT AND MATERIALS

Production Conference

(Continued from Page 27)

factors that has sufficient effect to outweigh the influence of organic matter, pH and moisture effects.

• **Plant Metabolism Affects Control** — Recent fundamental research studies have demonstrated for the first time that the selective herbicidal action of a chemical may be determined by the changes that the chemical undergoes as a result of metabolic processes in plant cells. As early as 1904, a German scientist showed that chemicals, when fed to animals, could be metabolized to entirely different compounds in the animal body. This finding served to stimulate investigations on the possibilities that the molecules of herbicidal chemicals might be metabolized and degraded by similar mechanisms in plants.

In some fundamental investigations in 1947, American scientists synthesized and studied the physiological activity of a series of omega-2, 4-dichlorophenoxycarboxylic acids in relation to their bio-chemical role as herbicides. In this series of compounds, the length of the side chain part of the structure varied progressively from two carbon atoms in the simplest number, 2, 4-dichlorophenoxyacetic acid to eight carbons in eta-2, 4-dichlorophenoxycaprylic acid. It was observed that the homologues with an even number of carbon atoms in the side chain were active and that those with an odd number of carbon atoms were inactive except for nonsystemic activity at the point of application. This periodicity in the activity of these compounds led these workers to suggest that the members of the series higher than 2, 4-D were inactive per se, but were converted by the plant either to the active acetic acid homologue or in other cases to an inactive metabolic product. They suggested that these acids were betaoxidized by enzymes in plants and pointed out that if the oxidation resulted in the removal of two carbons in each step, only those members possessing even numbered carbon chain acids could rise to the active acetic acid member of the series.

In more recent investigations, British scientists confirmed the previous work of scientists in the U.S. that omega-substituted phenoxyalkylcarboxylic acids containing an even number of carbon atoms in the side chain could be degraded in plants to the highly active acetic acid derivatives. These investigations have demonstrated the possibility of using several of these compounds for the selective control of weeds based on the differences in the enzymatic constitution of plants and the properties of certain enzyme systems to metabolize inactive compounds to herbicidally active derivatives.

Further research is critically needed to determine the roll of enzymes in the selective herbicidal action of chemicals. However, for the first time, there is substantial evidence that selective herbicidal action of chemicals may not only be influenced but may often be controlled by their metabolism in plant cells.

While these studies have not resulted in a new group of compounds that can be used for selective control of weeds in cotton, the gamma-phenoxybutyric acids have shown excellent promise for the post-emergence control of broadleaved weeds in a number of crops.

The investigations also have resulted in an entirely new approach to selective chemical weed control which may have an important influence on the development of selective chemicals for use in a variety of weed-crop situations.

I have attempted to discuss only three examples of some of the aspects of selective weed control with chemicals. However, I feel these examples are sufficient to indicate the rather remarkable potential progress inherent in research in this field.

• **Current Research Needs** — What are our current needs for a more effective weed control program in cotton? If you were to ask this question to every cotton-weed research worker in the country, the answer would be quite similar: (1) An effective soil fumigant or temporary soil sterilant to be used as a pre-planting treatment, that will kill the weed seed in at least the germination zone for one crop season, or (2) an effective residual type pre-emergence herbicide which is not adversely affected by environmental and edaphic factors, or (3) a very effective post-emergence herbicide that enters weeds through their leaves rather than by absorption through the roots that may be easily applied with safety to cotton of all ages, and (4) simpler herbicide application equipment.

We need to know more about the magnitude of the competitive effects of varying populations of weeds in cotton. The rapid developments in weed control and the lack of trained personnel have not permitted sufficient time to study the life histories of the important weeds in cotton. What factors control the germination of weed seed? Basic information is critically needed on the germination, dormancy, longevity, and viability of weed seeds as influenced by various environmental factors such as light, temperature, moisture, and others.

Far too little effort is being devoted to the long term effects of herbicides on soils and the effects of various soil properties on the efficiency of herbicides. We are slowly developing information on the gross effects of soils on the efficiency of pre-emergence herbicides. However, little information is available on the factors involved in the differential absorption of herbicides, and mineral elements by the roots of plants.

We are applying herbicides to the surface of soils in extremely thin films. Little or no research has been conducted on the stability and factors affecting the stability of chemicals applied to soils in mono-molecular layers. This is a challenging field of research to soil physicists and one which could contribute much to the field of weed control.

Too little research effort is being devoted to the basic aspects of weed resistance to herbicides and the changes in the ecological status of the weed flora as a result of weed control programs. We have evidence that resistance of weeds to herbicidal compounds may arise through the development of resistance within a species due to mass selection (and other genetical pressures) of the most tolerant plants of the species, and through changes in the botanical composition of the weed flora when weeds susceptible to the herbicide being used is replaced by the more tolerant species.

Fundamental studies on the mechanism of action of herbicides in plants are critically needed. We need more basic information on the absorption and translocation of herbicides in plants, the effects of herbicides on respiration, photosynthesis and other physiological processes in plants, the role of enzymes in the action of herbicides and the effect of various environmental factors on the selective action of herbicides. What are the sites of herbicidal action? What physiological processes are involved? What are the mechanisms of action? Such information would (1) Provide for more efficient utilization of the herbicides presently available, (2) assist in developing more sensitive methods for evaluating new herbicidal compounds, (3) help explain the tolerance or susceptibility of different species and varieties of plants to herbicides, (4) explain why some chemicals possess herbicidal properties and certain closely related derivatives do not and (5) provide information which will be valuable in the systematic synthesis and development of new compounds.

Additional research is needed to fully explore the potentialities of preplanting weed control techniques.

Supplemental irrigation in humid areas can also be expected to bring forth more acute mid- and late-season weed problems.

It seems that our future rate of progress in cotton weed control will be largely determined by: (1) The discovery of more selective, more specific, better translocated, more efficient, better formulated, and more economical herbicides, (2) a basic fundamental understanding of the effects of chemicals on plant growth and soils, (3) our ingenuity in supplementing and combining chemical and cultural practices, and (4) the development of new and more efficient weed control techniques.

SYMPOSIUM:

What's New In Control Of Cotton Insects

W. A. RUFFIN, Alabama Extension Entomologist, Auburn, Leader.

Conventional Chemicals — Dr. Dial F. Martin, Entomologist, Department of Entomology, Texas A. & M. College, College Station.

Conventional insecticides receiving a large amount of attention in 1956 included the organic phosphorus compounds, calcium arsenate, arsenical spray materials, and granular formulations of several insecticides.

It seems that most investigators wish to make further studies of the granular materials for boll weevil control as well as for the control of other pests.

In a small plot experiment in Texas, control of the first generation boll weevils with applications of granular materials showed promise but the results were not conclusive. Protracted drouth caused a high natural mortality of the weevils and drastically reduced the fruiting period of the cotton plants.

Against thrips, a Texas researcher found that three applications of dieldrin applied at the rate of 0.1 pound per acre at weekly intervals in a small plot experiment resulted in significantly better control than two bi-weekly applica-

tions of two and one-half percent heptachlor, two percent dieldrin, two percent aldrin or 10 percent toxaphene formulated as granules and applied at 25 pounds per acre per application.

• **Phosphorus Insecticides** — Several phosphorus insecticides received special attention in tests throughout the Cotton Belt during the 1956 season.

Guthion was used in tests in practically all states where the boll weevil is a problem. For weevil control, it appears that Guthion must be used at the rate of about 0.25 to 0.5 pound per acre. The material will give little bollworm control at this dosage but the addition of 0.5 to one pound of DDT or an increase of the dosage of Guthion will control the bollworm. When applied at 0.5 to 0.75 pound per acre this insecticide will give good control of pink bollworms.

Louisiana, Mississippi, South Carolina, Texas, and Alabama reported good boll weevil control from the use of Guthion. In fact, most investigators reported outstanding control with this material. Those who tested Guthion against bollworms did not find it effective at the dosage used for weevil control. Apparently the addition of DDT will be necessary to control bollworms.

Control of thrips in Texas with Guthion at the rate of 0.25 pound per acre was about as effective as commonly recommended chlorinated hydrocarbon insecticides such as dieldrin and toxaphene. However, the residual effect of Guthion was several days shorter.

Methyl parathion for weevil control has also been effective. Mississippi, Texas, Louisiana and South Carolina reported good control of weevils with dosages ranging from 0.25 to 0.5 pound per acre. It was necessary to add 0.5 to 1.5 pounds of DDT per acre to the methyl parathion for bollworm control. The large amount of methyl parathion used in Louisiana during 1956 may have had some influence in preventing a serious infestation of aphids and mites. Texas reported good control of the cabbage looper when regular applications of methyl parathion-DDT were applied for bollworm and boll weevil control.

Malathion also came in for additional study during 1956 for boll weevil control. Rates varying from 0.5 to two pounds per acre were used with results somewhat confusing. It appears that more than one pound per acre per application will be necessary for effective control.

Results from mixtures of chlorinated hydrocarbons with malathion and methyl parathion have been erratic.

EPN in small plot experiments gave effective control in certain areas of Louisiana where boll resistance is a problem. It was applied at the rate of 0.5 pounds per acre. Texas obtained weevil control with EPN equal to that obtained with 0.34 pound of endrin. South Carolina also obtained a good weevil control wth 0.5 pound of EPN.

Phosdrin, another phosphorus insecticide, was tested during 1956. The very short residual properties of this compound appear to be the principal limiting factor to its use on cotton. Phosdrin appears to be toxic to a number of insects. Arizona reported promising control of the cotton leaf perforator in a number of field trials using 0.375 to 0.5 pound of Phosdrin per acre.

Thrithion, used in California, is an extremely promising compound for control of mites and aphids. It's not effective in controlling most lepidopterous larvae, but does a very good job against cotton leaf perforator, probably because of its prolonged residual activity.

Thiodan, a new sulfur compound, seems to perform in a smiliar manner to the chlorinated hydrocarbons in boll weevil control. Thiodan will not control weevils that are resistant to the chlorinated hydrocarbons, as demonstrated in tests performed in Louisiana and Texas.

California reported good control of lygus bugs, stink bugs, the bollworm, and the cabbage looper in limited tests with Thiodan. Texas reported fair to good control of the cabbage looper when regular applications of Thiodan were made for boll weevil and bollworm control.

Calsium arsenate dust had to be used again in 1956 because of boll weevils' resistance to the chlorinated hydocarbons in 1955. Excellent control was obtained by Louisiana farmers who alternated with low lime calcium arsenate plus five percent DDT plus one percent parathion.

Calcium arsenate and low lime calcium arsenate plus DDT, applied as dusts, were the most effective treatments for boll weevil control in small plot experiments conducted in Texas during 1956.

There is need for an effective arsenical that can be applied in spray form. Some work was done at the Texas station but all formulations tested caused at least some burning.

Systemics — K. P. Ewing, Head, Cotton Insects Section, Entomology Research Branch, USDA, Beltsville, Md.

During 1956, the seed treatment method of applying carbon dust and insecticide to the seed before planting continued to be the most effective and economical means of feeding systemics into the sap stream of the plant.

Thimet, formerly known as American Cyanamid 3911, and the new phosphorus compound Bayer 19639, were tested as seed treatments in many field experiments across the Cotton Belt. Almost without exception, each of these insecticides gave excellent control of thrips, aphids and spider mites where these pests were a problem on seedling cotton. When applied at a dosage of one pound per acre the effective period after plant emergence was usually around four to six weeks; in a few instances longer and in a few shorter. At one-half pound per acre the effective period was reduced from one to two weeks. In most experiments there was not much difference between the two insecticides in their insect killing ability, with slight advantage in some experiments for Thimet against thrips and in others for Bayer 19639 against aphids.

Neither Thimet nor Bayer 19639 gave satisfactory control of over-wintered weevils, although in a few experiments early weevil infestations were somewhat suppressed. They were effective against light but not against heavy infestations of cutworms. They gave fair to good control for a limited time against the cotton fleahopper, white flies, flea beetles, leaf miners, cotton leaf perforators, darkling beetles, false wireworm adults, and the brown cotton leafworm in experiments where insects occurred.

• **Opportunity for Tests** — There was opportunity this year in South Texas of testing the systemics against early-season heavy infestations of aphids.

Ten large-scale experiments were conducted in the Coastal areas of Texas from Corpus Christi to Port Lavaca using Thimet as a seed treatment at approximately one pound per acre. Six

Board Members of Cotton Batting Institute Named

SERVING AS 1957 board members of the National Cotton Batting Institute, which met recently in Chicago, are (seated left to right): Henry Chanin, vice-president; Mrs. Augusta Brough, assistant secretary; C. E. Theobald, Jr., vice-president; David Schimmel, retiring president; R. T. St. John, executive secretary; Ellis H. Warren, new president; William J. Ockrant, and S. E. Brandwein, secretary. Back row: J. Graham Short, E. R. Kauders, Dan L. Clark, Robert H. Weir, C. Edward Lenz, Ralph M. Quinn, Arthur Siegle, Keith Steiner, William J. McEwen, treasurer, and L. V. Rando, assistant treasurer. Details of the meeting were reported in the Dec. 1 issue of The Press.

weeks after planting, the untreated cotton averaged 14 aphids per square inch of leaf surface and the treated averaged 0.3, or a ratio of 47 to one. Where the infestations continued, the control continued for several weeks longer. In the most heavily infested field, the plant height in the treated plot was approximately twice that of the untreated two months after planting. Twelve weeks after planting, or on June 7, the treated cotton averaged 19 forms (squares, blooms and bolls) per foot of row, and the untreated average nine. The aphid control was reflected in the yields, the increased production from the Thimet seed treatment being 39 percent.

Another type experiment on aphids was conducted at Florence, S.C. And if the results are borne out in further experimentation, they may be of tremendous practical value, especially where calcium arsenate is used for boll weevil control.

A seed treatment experiment with Thimet, Bayer 19639 and untreated check was planted April 19. Five applications of calcium arsenate were applied to the entire experimental area between July 20 and Aug. 3 to try to build up an aphid population. By Aug. 10 a heavy aphid infestation had developed in the untreated check but not in the systemic treated plots. On this date, or three months and three weeks after planting, the check averaged 100 aphids per square inch and the systemic seed treated plots averaged less than one aphid per square inch.

In a majority, but not all, of the experiments across the Belt, seed germination was reduced or retarded by Thimet and Bayer 19639. In a few instances replanting of the treated plots was necessary. In most instances, however, there was no difference in the stand of cotton in the treated and untreated plots after the usual chopping or thinning of the plants took place.

Phytotoxicity in the cotyledonous stage was common, marked by brown spects or spots on the cotyledons. In only a few instances was this characteristic carried over to the true leaves.

On the whole, phytotoxicity at the one pound per acre rate or above was greater from Thimet than from Bayer 19639. However, insufficient yield records were received to properly evaluate the systemics from this standpoint.

• **Application Hazard** — Thimet and Bayer 19639 are highly toxic to warm-blooded animals, including man, and they present an application hazard. For safety in handling and to insure proper mixing, custom treatment of the seed by trained personnel, as was done in 1956, is recommended as the best method of distributing the insecticides for large-scale experimentation and for farmer use.

The American Cyanamid Co. furnished Thimet custom-treated seed for 736 County Agent demonstrations in 13 states during 1956. I received from A. C. Bennett, Mississippi Extension entomologist a more or less complete report from 156 such demonstrations conducted in Mississippi. The Thimet treated plots obtained a stand equal to or better than the check plots 85 percent of the time. The treated cotton emerged with or earlier than the untreated cotton 90 percent of the time. Some fields did not have insect infestation. Regardless of presence of insects the Mississippi report showed the following results from Thimet:

Thrips: Five percent no control, 32 percent some control, 24 percent moderate control, 38 percent good control; where growers had heavy infestations, 98.5 percent reported medium to good control.

Cotton fleahoppers: 23 percent no control, 50 percent some control, seven percent, medium control, and 20 percent good control.

Boll weevil: 28 percent no control, 47 percent some control, 11 percent medium control, and 13 percent good control.

Cutworms: 44 percent no control, 45 percent some control, eight percent medium control and three percent good control.

Reports from 171 farmers who used Thimet in the Waco, Texas, area indicate the following:

Planting conditions: Adverse in March and April and good in May.

Stands: Good 55 percent, fair 28 percent, poor 11 percent, and no stand six percent.

Thrips control: Period of effectiveness ranged from 0 to eight weeks, with an average of 4.6 weeks.

Insect control in general: 84 percent were satisfied.

Future use: 72 percent of the farmers said they would plant treated seed again next year. Others commented they might use Thimet again if the treatment was cheaper and if weather conditions were more favorable.

Custom treatment of seed with Thimet cost farmers about $3 per acre this year. It is estimated that between 3,000 and 5,000 acres of commercially treated seed were planted in Mississippi; between 15,000 and 20,000 acres in Texas and a few thousand acres were scattered in Arkansas, Louisiana, Oklahoma, Missouri, New Mexico and Arizona. It is expected that the volume will be considerably increased in 1957, especially in Texas and Mississippi.

Workers Recommend Moist Corn, But Not Liquid

■ **CORN high in moisture proved better than dry corn in feeding tests at two research centers, but the agricultural workers have hastened to add that "high-moisture" corn is not the kind that comes as a bottled liquid.**

Livestock and poultry experiments at New Jersey Experiment Station and Purdue University indicated that corn with nearly 30 percent moisture was slightly better than dry corn for poultry and hogs. The moist corn was sealed in containers, and the research was done in an effort to help farmers solve the problem of excessive moisture in corn which causes the grain to spoil quickly under most storage conditions. Continued research, the workers believe, might result in the storage of such corn in plastic containers for use in farm feeding.

Cultural Methods and Timing —

**Dr. T. F. Leigh,
Assistant Entomologist,
Entomology Department,
University of Arkansas,
Fayetteville.**

Several cultural methods may be used to reduce pest populations, but are not fully effective by themselves and need to be supported by well-timed insecticidal control.

Stalk shredding has proved every effective in reducing the number of pink bollworms going into hibernation through mechanical kill. In hot regions, shredding will help get infested residues onto the ground where mortality from sun and ground heat is high. Stalk destruction is also useful in reducing the fall brood of the boll weevil and the pink bollworm by preventing reproduction in late season squares and bolls and by starvation.

Fence rows and waste land that were formerly available for boll weevil hibernation have been greatly reduced by use of modern cultivation equipment. In areas such as the Mississippi Delta of Arkansas, cleanup of such quarters may help reduce the over-wintering population of boll weevils so that insecticidal control can be delayed until emergence of the second summer brood.

Speed and uniformity of planting may also be achieved with the newer cultivation equipment so that a stand of cotton even in size and development is possible. Patches of early cotton are less likely to occur in which the overwintered boll weevils concentrate and require control. In fields with uniform growth bollworms also are less likely to be concentrated in spots.

The farmer who plants corn in addition to cotton may take advantage of the bollworm moths' preference for silking corn on which to lay its eggs. Two or three plantings of corn made about a week apart and planted so that they will be in silk at about the time of maximum moth emergence may greatly reduce the likelihood of a bollworm outbreak in the cotton.

With available varieties of cotton, fertilizers and irrigation, the cotton farmer can now choose between early production and maximum yield. If located on less productive land and where irrigation is not economical, he may choose to plant an early, hardy variety that will fruit quickly. His crop will largely be produced before the boll weevil and bollworm infestations have built up and will require a minimum number of insecticide applications. The farmer located on more productive soils may find it profitable to plant a prolific variety of cotton and use high fertilization and irrigation. But this farmer must be prepared to make more judicious use of insecticides to compensate for the extended fruiting season and more favorable conditions provided for the boll weevil by irrigation.

• **Insecticide Application** — The level of infestation at which application of insecticides should be begun has been determined for most cotton insects by research workers in each area concerned. In the case of the boll weevil, the present recommended level at which control is begun ranges from 10 to 40 percent punctured squares. Several states use a movable level based on current weather conditions. For example, in Arkansas

the level at which control is started ranges from 10 to 40 percent. During humid weather with frequent rainfall, the weevils live longer, natural mortality is lower, and damage may be extensive. Under such conditions treatment should be begun at the 10 percent level. When the weather is hot and dry, natural mortality will be high and control may be delayed until more than 40 percent of the squares are punctured. When the weather conditions lie midway between these extremes, control should be begun when more than 25 percent of the squares are punctured.

The stage of growth of the plants is important in determining when to commence insecticide applications and when they should be terminated. Since plants in vigorus growing conditions are able to replace many of the squares damaged by the boll weevil, bollworm and other cotton insects, it may be neither necessary nor economical to try to protect all squares. The plant is not capable of retaining all of the squares it produces. Loss of a few squares to the boll weevil or bollworm in early summer should not impair the later production of a good crop if proper controls are then used. In fact, loss of early squares may promote growth of a larger plant that will be capable of producing a greater crop. Control of the boll weevil may usually be delayed until the first summer brood appears, and protection of plants from injury by the bollworm will probably be of little value until bolls are present. Once started, control of the boll weevil and bollworm should be continued until square formation has stopped and bolls are too old for successful attack by these pests.

• **Irrigation and Control**—The most significant function of irrigation from the standpoint of insect control is to prolong the growing season. Fields remain succulent and squaring for a long period of time. They may be more attractive to bollworm moths and more favorable for survival of the boll weevil. Irrigation may also interfere with insecticide application schedules where ground equipment is used.

The value of cultural control methods and proper timing of insecticidal applications in delaying build-up of resistance to insecticides by cotton insects should not be overlooked. Any method that will reduce the number of insecticide applications required may reduce the rate at which insects will become resistant, while numerous and carelessly timed applications that kill only a small portion of the insect population will greatly increase the rate at which resistance develops.

Application Methods —

E. Buford Williamson, Agricultural Engineer, Delta Branch Station, Stoneville, Miss.

No insecticide, regardless of its ability to kill, can reach its optimum effectiveness unless it is deposited on the plant properly. Insufficient dosage or coverage will not be effective, and excessive amounts will be wasteful and expensive, We've known this a long time, but it's still a problem.

Another problem is the potential hazard of the new phosphates. This presents a great challenge to those concerned with the application of insecticides. It is not insurmountable, however, since several large corporations use enough phosphate material annually to kill several times the population of the earth and yet have enviable safety records.

• **Airplanes Aid Agriculture** — The airplane has played a prominent role in the fight against cotton insects, and agricultural aircraft research promises to strengthen that role in the years ahead. We have been informed that results of the aircraft development project at the aircraft research center of the Texas A. & M. College will be released soon. This project, sponsored by USDA. Texas A. & M. College and other cooperating agencies, was designed to fill the need for a fixed-wing aircraft which would be more suitable for agricultural purposes. Improvements in the first experimental models have included excellent visibility for the pilot, specially designed flaps and ailerons that give slow flight characteristics and slow landing speeds, and special cockpit safety features which provide greater protection for the pilot.

• **Spraying Equipment** — Particular emphasis has been placed on spraying equipment in recent years, since sprays are less affected by wind and adhere better to foliage under dry conditions. As a result, notable improvements have been made in the design and durability of various components of spraying equipment such as pumps, booms, nozzles, and tanks. A great deal of attention has also been given to droplet size, swath width and proper plane altitude at the time of application. Droplet size has been found to be of primary importance since it has been determined that the degree of atomization vitally affects the width of the spray swath, as well as distribution of the deposit on the plant within the swath.

A significant development in insecticide application methods was the recent introduction of self-propelled high-clearance ground machines. A limited number was used effectively in the Mississippi Valley area in 1955. This will be remembered as a year when late-season rains produced rank growths of cotton and severe insect problems. After their use became widespread in this area in 1956, a post-season survey was made to determine the general performance of this new tool. Through the cooperation of Extension workers, questionnaires were filled out by 106 owners who operated 130 machines during the 1956 season. The consensus was that one machine should be available for every 225 acres of cotton grown, in order to follow a three-day application schedule. Approximately 20 percent of the machines were equipped with inadequate power units. Sprayers were used on 90 percent of the machines and dust equipment on the remainder.

In citing the advantages of these machines, approximately 39 percent of the farmers listed "efficient coverage," 38 percent indicated "economy," 11 percent indicated "availability for maintaining schedules," 10 percent indicated they were better adapted for "use in small fields and for spot poisoning under power lines," and two percent listed "night application" as one of the merits.

The greatest disadvantage mentioned in the survey was the inability to operate the machines in wet fields. Almost one-half of the farmers referred to this as the limiting factor in their use, despite the fact that they had just experienced two relatively dry years.

Mechanical weaknesses were cited in the self-propelled vehicles as well as in application equipment. A breakdown of machine faults showed that 30 percent of the farmers listed drive chains, 27 percent listed breakage or bending of frames, 14 percent listed poor steering, nine percent listed engine failure, eight percent listed transmission failure and non-standardization of parts, six percent listed inadequate flotation and wheel failure, and six percent indicated the need for a lower center of gravity to prevent the machine from turning over.

In listing sprayer weaknesses, 42 percent of the operators had trouble with booms, nozzles and hoses. Boom breakage was reported in areas where machines operated in cross-plowed cotton. Nozzle stoppage resulting from rust in booms and tanks was a frequent complaint. Hose failures were attributed to the destructive nature of some of the insecticidal formulations used. Approximately 36 percent of the farmers had trouble with pumps. Failure to prime and short life were the major complaints reported. Spray tank corrosion, which often resulted in leaks and excessive nozzle stoppage, proved troublesome for 22 percent of the farmers. Inadequate filtering systems was another problem usually cited along with this complaint.

All of the owners who returned questionnaires signified that they would make these machines a permanent part of their farming operations. An appreciable number also expressed the opinion that present models would be replaced in years to come by much better machines.

One of the greatest limitations with all ground machines is failure to operate in wet fields. Increased tire width and improved drainage could probably alleviate the problem to a great extent. There will be seasons and conditions, however, that will warrant the use of aerial application.

• **Safer Handling and Application** — It is my opinion that the phosphate insecticides call for development of safer techniques of handling and application in ground and airborne equipment. The problem of safer machines for application is the duty of the engineers and I can assure you that our efforts will be so directed. Other groups have the responsibility of educating the workers as to the real danger involved and to precautions essential for safe handling of these new materials. Also, it is the moral and legal responsibility of the supervisor to see that precautions are used.

Some of the safety measures indicated are protective clothing, better mixing and loading equipment and convenient first aid facilities. Non-corrosive tanks and other sprayer components which reduce nozzle and strainer cleaning to a minimum, can also be a factor in developing safe operating practices.

But the use of common sense is most invaluable.

Insect Resistance To Chemicals

DR. L. D. NEWSOM, Head, Entomology Research, Louisiana State University, Baton Rouge.

During 1954, in areas at Natchitoches and Lake Providence, La., the chlorinated hydrocarbon insecticides failed to control the boll weevil satisfactorily.

Little damage resulted because severe drouth restricted yields and gave a considerable amount of climatic control of the infestations. Some growers expressed belief that the boll weevil had become resistant to these insecticides. This possibility was generally discounted. Failures were explained on the assumption that high temperatures and high wind velocities prevalent during much of the season reduced effectiveness of the insecticides used.

Weather during 1955 was just the reverse of 1954. Excessive rainfall over much of the state made conditions ideal for boll weevil development. By late July growers were in real trouble. Many who had a history of having had excellent boll weevil control for a period of several years had infestations completely out of control. Again, the possibility of resistance having developed was generally ignored. The trouble was explained on the basis of adverse weather conditions for insecticide applications, improper methods of application, poor timing, and heavy pressure from huge populations of boll weevils.

By the middle of August field plots at Tallulah, St. Joseph and Natchitoches showed clearly that resistance had developed to the point that BHC, toxaphene, dieldrin, endrin and heptachlor were no longer giving effective control of the boll weevil in some areas of Louisiana.

Laboratory tests were resorted to in order to obtain more precise information. A resistant population from St. Joseph was compared to a susceptible one from Baton Rouge. Results paralleled those in field tests. None of the chlorinated hydrocarbon insecticides performed satisfactorily when tested against the St. Joseph weevils but calcium arsenate and an experimental phosphate insecticide gave excellent control. All of the insecticides gave good control of the Baton Rouge population.

• **Treating Weevil Resistance** — Subsequently a technique for treating individual weevils with a known amount of insecticide was developed and this method of application gave the same results as field tests and laboratory cage tests.

These data were released to a group of entomologists at a meeting in Stoneville, Miss., during August and were published with additional data in September 1955.

Announcement that the boll weevil had developed resistance to the chlorinated hydrocarbon insecticides was greeted with much skepticism. A number of entomologists considered that excessive rainfall and low temperatures during the growing season, heavy boll weevil populations, failure to begin applications soon enough and seasonal tolerance to insecticides were the major factors responsible for failures to obtain satisfactory control of the boll weevil during 1955.

• **Would Resistance Persist?** — The big question at the end of the 1955 season was whether or not resistance would persist into 1956. As soon as boll weevils began to appear in the field, collections were made and insecticides applied topically. Results showed that resistance had persisted. From these and additional data it was concluded that resistance was genetically controlled.

Difficulty in controlling the boll weevil with the chlorinated hydrocarbon insecticides in 1955 was not limited to Louisiana. The South Delta of Mississippi and parts of two southeast counties in Arkansas were also involved.

Status of resistance to chemicals in cotton pests at end of 1956 season.

State	Pest	Status	Insecticide involved
Alabama	Boll weevil	Suspected	BHC and toxaphene
	Cotton aphid	Suspected	BHC
Arkansas	Boll weevil	Proved	Chlorinated hydrocarbons
	Cotton aphid	Suspected	BHC
California	Cabbage looper	Proved	DDT
	Salt marsh caterpillar	Proved	Toxaphene
	Spider mites (**T. pacificus** and **T. altanticus**)	Proved	Organic phosphates
	Beet armyworm	Suspected	———
	Cotton leaf perforator	Suspected	———
	Lygus hesperus	Suspected	DDT
	Southern garden leafhopper	Suspected	DDT
Louisiana	Boll weevil	Proved	Chlorinated hydrocarbons
	Cabbage looper	Proved	DDT
	Cotton aphid	Suspected	BHC
Mississippi	Boll weevil	Proved	Chlorinated hydrocarbons
	Cotton aphid	Suspected	BHC
	Spider mites	Suspected	Organic Phosphates
	Thrips	Suspected	Chlorinated hydrocarbons
South Carolina	Boll weevil	Proved	Chlorinated hydrocarbons
	Spider mites	Suspected	Sulphur and parathion
Texas	Boll weevil	Proved	Chlorinated hydrocarbons
	Onion thrips	Proved	Chlorinated hydrocarbons

All this helped focus attention on the growing problem of resistance to chemicals. The scope of the problem was revealed by a recent survey of cotton entomologists, who reported that resistance of one or more pests to insecticides was definitely proved or strongly suspected in seven states (See table for details).

• **What Causes Resistance?**—How does resistance come about? There are several theoretically possible mechanisms. But regardless of the mechanism involved, resistance has a genetic basis. In order for it to develop in a population, there must be a change in the genetic constitution of the population.

Genetic variability in insect populations is well established. It seems probable that there is enough variability already present in most species, or occurring continually as a result of mutation, for at least a small part of the population to have genes for resistance to a given insecticide.

If a population has genes which are capable of conferring resistance to an insecticide, and if enough pressure is applied through use of insecticides to select those individuals which possess such genes, susceptible individuals will be gradually eliminated and the population will become resistant.

Conversely, a population which does not possess genes for resistance cannot develop resistance unless genes are introduced from another source or mutation to resistance occurs.

• **Forty Species Resistant** — There are now known to more than 40 species of economically important pests resistant to one or more insecticides. The number is increasing at an alarming rate. And certainly the matter of resistance is the most important problem facing cotton entomologists today.

That this problem can be handled satisfactorily, at least on a short-range basis, was abundantly demonstrated in Louisiana during 1956. Louisiana recommendations for control of the boll weevil in 1956 called for use of calcium arsenate and methyl parathion in areas known to be highly resistant in 1955. Where resistance was suspected, use of the chlorinated hydrocarbons was recommended at the beginning of the season with the provision that a switch be made to calcium arsenate or methyl parathion as soon as these materials showed that they were not giving satisfactory control. The chlorinated hydrocarbons were recommended without reservation for those areas where resistance was not a factor.

Late in 1955 it was found that a technique of treating individual weevils topically with known amounts of insecticide could be used to determine whether a population was resistant or not. Early in 1956 an extensive program of testing weevils from various areas of the state was undertaken in cooperation with County Agents to delimit the area where resistance was a problem. By early July it was found that about two-thirds of the cotton acreage, including most of the Mississippi Delta, Red River Valley, Ouachita Valley, and Macon Ridge, was affected. Growers in these areas who had been advised to begin the season with chlorinated hydrocarbons soon found they were not getting satisfactory control and were advised to change to calcium arsenate or methyl parathion.

Grower response to such drastic changes in recommendations was highly gratifying. A typical example of the almost complete acceptance of recommendations was reported for Madison Parish where County Agent Max MacDonald reported over 90 percent of the growers switched from the chlorinated hydrocarbons to calcium arsenate or methyl parathion for boll weevil control. Growers were warned, of course, about the hazards associated with the use of calcium arsenate and methyl parathion.

Although it has been demonstrated that resistance can coped with on a short-range basis, long-range problems may be much more difficult. Switching from one insecticide to another is likely to provide nothing more than temporary relief.

It has been proposed by some authorities that mixtures of two compounds of entirely different modes of action, for example chlorinated hydrocarbons and phosphates, would prevent development of a resistance in a pest. Other proposals

have suggested alternating applications of such insecticides.

Whether such procedures will work with insects is not known. Experiments to test these proposals with the boll weevil are in progress at L.S.U. in cooperation with USDA.

An important question in resistance is whether reversion to susceptibility will occur if selection is relaxed by changing to an insecticide with a different mode of action. Theoretically, this should occur since genes which confer insecticide resistance must normally be detrimental to a population or the population would be resistant to begin with. Work to determine this point has also been initiated at L.S.U.

• **Need for Research** — There is an urgency in the need for research on resistance which has not been known for many decades. To illustrate, assume that the bollworm becomes resistant to DDT and endrin and that the cotton aphid becomes resistant to parathion. These might not be overly pessimistic assumptions. A relative of the bollworm, the cabbage looper, is already resistant to DDT and resistance to endrin is suspected. The walnut aphid, a relative of the cotton aphid, is resistant to parathion. Two species of spider mites are resistant to the organic phosphates in California.

Such developments in the Midsouth would leave many growers with the prospect of having to control boll weevils with calcium arsenate or methyl parathion; the bollworm with calcium arsenate or cryolite; the cotton aphid with nicotine; and spider mites with sulphur or aramite.

To prevent such an occurrence entomologists must put forth the greatest research effort in the history of cotton insect control. Basic studies are needed to determine if methods of manipulation of insecticide applications and insecticide combinations can be used to prevent or delay development of resistance in cotton pests. Fundamental studies to determine how insecticides kill insects are needed to supply information necessary for developing insecticides which will not allow resistance to develop so rapidly or to as high levels as has been the case with the chlorinated hydrocarbons. Toxicity curves for various insecticides should be established for all pests and potential pests, using populations wherever possible that have never been exposed to the insecticides. This information is needed to determine when resistance begins to develop in a pest.

There can be no excuse in the future for being caught as unprepared for the development of resistance in a pest as was the case with the boll weevil.

Basic Research for Control Of Insects Tomorrow

DR. E. F. KNIPLING, Chief, Entomology Research Branch, USDA, Beltsville, Md.

As you well know, the pressure for research on applied problems allowed little time for basic research in cotton insect control.

Against the boll weevil, for example, we've been putting most of our eggs into one basket. Practically all our efforts have been devoted to applied research on insecticides.

There are, of course, good reasons why most of the research efforts have been concentrated on this approach. The use of chemicals has thus far provided the only generally dependable and practical control for the boll weevil and most other cotton insects.

We cannot now conclude that it was a mistake to put so much effort on a continued search for new and better insecticides. In fact, it might have been a mistake not to have concentrated all available resources on these applied problems, for without the new insecticides, particularly the organic phosphates, we might not have them as substitutes if insect resistance becomes general and widespread.

The real mistake is that we have not been able to carry forward at the same time a broad program of basic research on many aspects of cotton insect problems.

As Dr. B. T. Shaw, administrator, Agricultural Research Service, said recently:

"Applied research is a kind of expediency we have had to exploit to attain the high degree of productivity which we enjoy today. But in attaining that high degree of productivity we have also been reworking our fundamental research information to the point of exhaustion. This is one account that cannot be overdrawn with impunity. It is time now to turn our minds, skills, facilities and money to the job of replenishing our supply of fundamental knowledge."

A more apt statement could not be made as an introduction to a discussion of basic research needs to develop sound insect control practices for the future.

• **Chemical Control** — The proved success with chemicals suggests that much of our effort should still be directed towards this approach to insect control. In the past, most effort has been devoted to a search for chemicals that kill insects outright. The high degree of effectiveness of the newer chemicals led us to believe that we were on the right track. But it is now clear that this narrow chemical approach to a solution of most insect problems is not the answer. We need to explore other ways to utilize chemicals for insect control. More intensive research relating to chemical control is indicated along these five distinct lines: (1) Insect physiology and toxicology; (2) the mechanism and cause of insecticide resistance in insects; (3) systemics; (4) attractants; and (5) growth regulators.

• **Insect Physiology and Toxicology** — We need to know more about the physiology of insects and why one species reacts differently than another to a given compound. Such information is needed to study and understand the mode of action of all kinds of chemicals—insecticides, repellents, and attractants.

What controls the various physiological processes in insects? If we knew more about this we might find a wider variety of chemicals that disrupt the normal development of insects.

• **Mechanism and Cause of Resistance**— With the resistance problem threatening to nullify advances in chemical insect control, the need for more information on the nature and cause of this resistance in insects becomes obvious. Considerable work has already been done in efforts to obtain basic information on this problem. Some joint basic research is being started on boll weevil resistance by the Louisiana Experiment Station and the Entomology Research Branch. However,

CLEAN COTTON went to gins in Central Texas this season where experienced stripper operators harvested better cotton than that gathered by hand pulling. Loads such as the one shown above graded Strict Middling and were harvested at a saving of $30 per bale. Much of the crop was out of the fields before Oct. 1 and many fields had the stalks plowed under so that farmers were ready to plant a winter legume or other cover crop.

the resistance problem is so significant we cannot over-emphasize the importance of more adequate support for additional investigations of this nature.

Are we building super races of certain insects? What will we face 25, 50 or 100 years from now? Our experience with the house fly may point to the answer. This insect developed resistance to DDT in the matter of a few years. We did have a sizeable list of what we regarded as good substitute insecticides to take care of the DDT resistance problem. We soon realized, however, that those chemically related to DDT were hardly worth marketing. Resistant strains were already slightly resistant to the related materials. Even worse, we soon found that flies already resistant to DDT became highly resistant to all chlorinated hydrocarbons after a few generations' exposure.

Change to a different type of insecticide? Organic phosphates have come into use in one form or another, and in general are giving satisfactory control of house flies. But we now have reports of phosphate-resistant flies from Denmark.

Certainly from a long-range standpoint we have little basis for counting on current substitute cotton insecticides as a permanent answer to the boll weevil resistance problem. I am still hopeful that insects will not have the capacity to become resistant to certain insecticides. It is time, however, to obtain more information to guide us in the selection and use of insecticides that will assure effective chemical control for an indefinite period of time.

• **Systemics** — The use of systemics on the basis of current knowledge would not necessarily surmount the resistance problem, but might overcome some of the objections and limitations of conventional insecticides. When employed as a seed treatment the problem of weathering may be less important. Systemics may minimize damage to parasites, predators, and the honey bee and other pollinators. They also might help overcome the increasing concern for the health of both man and animals resulting from large scale applications and drifts of conventional dusts and sprays.

• **Attractants** — Insects, to survive, must respond to certain natural vital attractants. They are attracted to their food supply; they are attracted to the opposite sex to mate, and they are attracted to the host plants or animals on which to reproduce.

It does not require a great deal of imagination to see the great possibilities of this virtually unexplored field. What attracts the boll weevil to cotton plants when they come out of hibernation? How do boll weevils find the cotton fields? Why does a boll weevil oviposit in squares or bolls and no other part of the plant? If we knew a few of the answers and could then find substances that equal the host plant in attractiveness it might be a simple matter to revise effective ways to lure and destroy the insect.

We know enough about sex attraction among insects to recognize potentialities in this field. Even if sex attractants do not lead to a direct means of insect control, they can be of vital importance in detection.

We need to fill our storehouses with fundamental knowledge of insect attractants. Our limited success in using attractants in the past is unquestionably due to a lack of basic information.

I doubt seriously if the boll weevil would develop resistance to an attractant that duplicates the characteristics of a cotton square, nor, for example, would the male gypsy moth become resistant to the attractive substance that is produced by the virgin female moth.

■ Brief . . . and to the Point

W. A. FLETCHER, a Georgian who farms near Tifton, recently commented on supplemental irrigation as follows:

"I've never seen a year since 1919 when our crops didn't need more rain than we got. Irrigation's made $2,000 or more for me every year I've had it."

• **Growth Regulators** — Great advances are being made in research on growth regulating substances on plants and livestock. Why cannot we find growth regulating substances that will produce effects in insects that are equally as great? Is it necessary that we kill insects outright to achieve control? Wouldn't a material that destroys in a week or a month often achieve the same end result? In fact, based on the indicated success of the sterile male technique through irradiation for controlling the screw-worm, it would be much more effective to sterilize male insects than to kill them.

• **Cultural and Biological Control** — If we cannot resolve the resistance and the hazard problems associated with the use of chemicals we may be forced to rely on other methods.

Normally, every insect species has natural obstacles that tend to limit its rate of increase. The first is its food supply. Unfortunately current agricultural practices provide a made-to-order diet for many pests.

Natural enemies are a second major obstacle to the well being of insects. We all know that if we did not have insect parasites, predators and diseases working for us we would face a hopeless task in trying to protect most of our crops from insect destruction.

A third obstacle is adverse weather, and the fourth is the constant effort by the host plant or animal to resist damage by the insect.

Let's consider how basic research could help us utilize these obstacles in cotton insect control.

• **Cultural Control** — We may not be capitalizing on the opportunities to defeat the boll weevil by disrupting its food supply through cultural measures. The boll weevil's complete dependance on cotton could be its downfall. Our research program on the pink bollworm is giving primary consideration to cultural methods for controlling this pest. Regulating the time for planting and destruction of the cotton plants after harvest has been highly successful in keeping pink bollworm losses to a minimum.

Much information is available on the probable success of this way to reduce losses by the boll weevil in some areas of the Cotton Belt. But we still lack much basic information which is needed to develop cultural methods for boll weevil control throughout the boll weevil area. Do we know what causes boll weevils to go into and come out of hibernation? Do we know just when they go into and come out of hibernation in various areas of the Cotton Belt, and to what extent this varies from year to year? What about the last squares and bolls that plants produce but never mature because of cold weather? Are these primarily responsible for producing the surviving boll weevils the next spring? What is the best way to prevent late fruiting? Should we concentrate on destruction of the late maturing boll weevils by chemical means?

In considering the merits of this approach, we might keep in mind that if the boll weevil and the pink bollworm could be taken care of through cultural means, parasites and predators might have better opportunities to keep the bollworm, aphids and certain other cotton insect pests under control. The beekeeper and those dependent on bees would also be happier.

• **Biological Control** — I have already referred to parasites and predators and the importance of utilizing them to prevent insect losses. We need to make more effective use of these beneficial insects. There is a great deal to be learned about insect diseases—viruses, bacteria, protozoa, fungi and others. It is possible that these disease organisms may exert a greater effect on insect control than parasites and predators. We need a thorough study on the kinds of insects pathogens that exist and the role that they play in controlling insect abundance. We need to determine how to utilize them in developing practical ways to control insects. Because of the highly specific nature of insect diseases, it is probable that their use would go a long way towards minimizing hazards to beneficial insects and to man and animals.

• **Climate** — Regardless of the methods of insect control that might be developed and recommended to the grower, we as entomologists have an important additional responsibility which we have not fully assumed in relation to many insects. I refer to the information a grower needs in determining when he should or should not apply control measures. To do this we need much more information than we now have on estimating insect abundance and forecasting insect population trends. A thorough understanding of the influence of many factors including weather, is essential in this important aspect of insect control.

• **Plants Resistant to Attack** — The development of suitable plant varieties resistant to insect attack approaches the ideal as a means of reducing insect losses. Otherwise desirable varieties which resist insect attack represent no extra cost to the grower. Good results have been achieved in instances where plant breeders and entomologists have undertaken an intensive program of joint research to develop insect resistant varieties. Varieties of wheat are available which are virtually immune to hessian fly attack. Corn earworm resistant varieties of sweet corn are available. Losses due to the European corn borer are greatly reduced through the use of corn varieties which resist insect attack.

It is difficult to understand why greater research effort has not been devoted to this method of insect control. Undoubtedly the reason is that most insect control efforts are initiated as a crash program; that is, an immediate solution is needed to overcome an acute pest

problem. The development of a suitable resistant variety will usually require 10 years or longer of research effort. The grower often cannot afford to wait this long for a satisfactory solution. I feel, however, that the time has come that we should give research on varietal resistance the attention that it deserves, even though practical application of the findings may not be realized for 10 to 25 years.

Cooperative Pink Bollworm Research—Progress and Problems

CLAUDE L. WELCH, Director, Division of Production and Marketing, National Cotton Council, Memphis.

Just a few short years ago, the U.S. cotton industry suddenly found itself confronted by an emergency.

The pink bollworm—after being pretty well bottled up in South Texas over a long period of time—was getting out of hand and threatening to over-run the entire Cotton Belt.

This might not have been too alarming except for one chilling fact: We simply didn't know much about controlling the pink bollworm in most areas of the Belt. South Texas producers, with their long growing season, had been able to live with the pink bollworm by following a rigidly-enforced program of cultural control. But this sort of program would not be nearly so practical, not nearly so effective, in areas with shorter growing seasons.

What's more, there was no insecticide which growers could rely on for dependable, economical control of the pink bollworm.

In short, growers over much of the Belt were faced with the prospect of being invaded by a bug that could be worse than the boll weevil; and they weren't equipped to fight back.

• **Research Answer to Threat** — It was easy to envision the possibility of broad, tremendously-expensive non-cotton zones —of mandatory installation of expensive seed sterilization equipment at gins and oil mills across the Belt—of massive sets of government regulations on production and movement of all materials subject to pink bollworm infestation. It was easy to envision a giant industry threatened with ruin by its inability to cope with a tiny little worm that measures only about a half-inch in length.

The most obvious answer to this threat was research. We urgently needed a large research program dedicated to the task of finding adequate weapons for fighting the pink bollworm—and perhaps for eradicating the pest from this continent.

But research took money and there just wasn't enough money available for an adequate program. USDA, which traditionally would carry most of the responsibility for regional research of this type, had only $50,000 for pink bollworm studies. An adequate program, as projected by the Beltwide Pink Bollworm Committee, would cost well over $250,000 a year. And, with a new economy-minded administration taking over in Washington, there was little chance for USDA to win a quick build-up in appropriations for pink bollworm research.

That was the emergency situation we faced. It had to be handled some way. And the way it was handled has become, in my opinion, a classic example of what can be accomplished through cooperation.

• **Cooperation Was the Key**—The effort to develop an adequate pink bollworm research program has involved a three-way pattern of cooperation between the federal government, various state governments in the Cotton Belt and the cotton industry. Representatives of these groups formed a Beltwide Pink Bollworm Committee which analyzed the problem, mapped a research program to combat it and generated widespread support for the program.

The same groups have cooperated in financing the expanded research program. Federal funds for this purpose have more than quadrupled since the fiscal year of 1950. The cotton industry, through the Oscar Johnston Cotton Foundation, has provided $35,000 to $40,000 a year for pink bollworm research. Contributions of cotton states—including Texas, Louisiana, Arkansas, Mississippi, Alabama and Georgia—reached a level of around $100,000 in the fiscal years of 1955 and 1956.

I think it is worth special note that our host state of Alabama and its neighboring state of Georgia—both hundreds of miles from the area infested by pink bollworms—are supporting the research program for the fourth consecutive year in fiscal 1957.

All of us who have had a part in this cooperative program can be proud of what it has accomplished up to now, for the research payoff has been coming much faster than most of us had expected.

• **Fewer Losses Reduce Costs**—Already, cotton industry savings from this program come to well over $2,225,000 every year—compared with a cumulative research expenditure of just over $1 million since the expansion began in 1951.

Earlier this year, Texas and New Mexico officials announced that gin sterilization of cottonseed moving within their states would no longer be necessary. Research had shown that modern ginning kills all—or almost all—of the pink bollworms in cottonseed. So there was no longer any need for costly gin sterilization—except perhaps in the "fringe" areas where light infestations might be eradicated.

Last year, as another result of research, oil mills over a large part of the quarantine area were given relief from the costly process of sterilizing seed or fumigating various products before they could have unrestricted movement. Instead, oil mills could kill all pink bollworms by passing linters, motes and hulls through an inexpensive single fan meeting certain specifications. This has meant a huge annual saving to oil mills in infested areas.

Research also has proved that a single fan treatment will kill all pink bollworms in gin trash. Until this process was approved last year, gin trash had to be burned or given other treatment. Now ginners can not only eliminate a fire hazard and smoke nuisance, but also make large tonnages of trash available for livestock feed and soil improvement.

These are some of the dollars and cents research dividends that are already going to cotton people in the pink bollworm infested area. But they have tremendous significance, too, for cotton people who still remain outside the infested area.

• **Danger of Break-Through** — For, despite our success in holding the line against further pink bollworm spread over the last two years, the danger of a sudden build-up and break-through is always with us. We hope this doesn't happen. But if it does, the research already completed will have made it far easier and less costly for cotton people to live with the bug in newly infested areas.

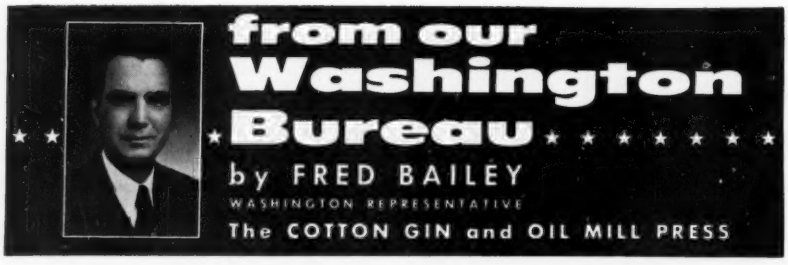
So, we see that just a few phases of the expanded research program are already paying off far more than the total cost of the whole program. Other phases of work promise much greater dividends, and I would like to mention just two of these in order to show the importance of maintaining the program at an adequate level.

• **New Phases of Control**—One of these phases of work has to do with possible use of a nematode parasite in pink boll-

(Continued on Page 44)

Cotton's in Ice Follies

THE NATIONAL Cotton Council doesn't miss a thing. Cotton costumes play a big part in the 1957 Ice Follies. This young lady's blouse is tangerine cotton with black-stitched patches. All costumes are lined with cotton broadcloth.



• **Spotlight on Soil Bank** — Higher cotton Soil Bank payments in the New Year? Answer to that is now a definite "Yes."

The "new" system for figuring yields will raise the average per-acre payment from $46.35 in 1956 to an estimated $54.15 in 1957. Congress may change the Soil Bank, but won't lower payments. Inclination of the lawmakers is to increase rather than reduce outlays.

Cotton growers who have had above-average yields in their county will receive relatively higher Bank payments. The producer's output in recent years, as well as national and county production averages, will be taken into account in establishing a grower's final yield figure.

The final yield figure multiplied by a unit payment rate determines the size of a grower's Soil Bank check. Unit payment rate for cotton of 15 cents per pound will remain unchanged in 1957, unless Congress increases it.

Lawmakers are wasting no time in turning the spotlight on the Soil Bank program. Hearings will start Jan. 7, "to review the operations of the Soil Bank in 1956 and to receive suggestions for improvements . . . in 1957."

First witness before the committee will be Secretary Benson. Said Agriculture Chairman Harold Cooley (D., N.C.), "Members of the committee want to know why so much Soil Bank money was spent in some areas, and so little in others. Figures show that for each dollar of the acreage reserve commitments made for 1956, the corn area received 69.2 cents, wheat 17 cents, cotton 10.5 cents, tobacco 2.6 cents, rice one-half cent and peanuts one-fifth of a cent."

Committee members already have urged an increase from 18 cents to 25 cents per pound in the unit payment rate for tobacco. Pressure for higher payments in the South is almost certain to be resisted by law makers from other areas, but a deal is possible along these lines: Higher outlays in the South in return for a larger total Soil Bank appropriation, so that nobody gets hurt.

Otherwise, an increase for one section of the country could mean a decrease in payments elsewhere. As the law now stands, there is a ceiling of $750 million on payments that may be made on cropland going into the acreage reserve.

• **Cotton Will Compete** — Competitive pricing of U.S. cotton in world markets is almost certain to be continued for at least another year and a half, perhaps longer. This appears assured not only because of the recent jumps in exports, but because of strong backing for the program from influential quarters.

American Farm Bureau Federation, at the recent convention, re-affirmed that powerful farm group's stand in favor of "competitive prices in world markets". Delegates also asked for (1) restrictions on imports of cotton textiles, (2) textile labeling, (3) expanded research, (4) price floors for cotton based on average crop quality, (5) study and overhaul of USDA's cotton grading program.

Biggest headlines were made by President Charles Shuman when he called for an end to government purchase-storage programs—at such time as surpluses of a given commodity may be unloaded. Delegates took no direct action to confirm or deny the position taken by Shuman, but they passed a resolution that made it plain they may take further action on the President's suggestion.

"We urge that the . . . board of directors make a comprehensive review of the laws," said the resolution, "and seek for the consideration of the delegate body revisions necessary to achieve our objectives of gradually eliminating government regulations of individual farming operations as rapidly as possible. We further recommend that the board study the possibility of reducing the need for direct aid to agriculture by giving farmers more equitable treatment under federal, state, and local tax laws."

• **No "New" Program** — You can discount talk of a return in the New Year to "rigid" price supports, and also of any "new" program that would mean the elimination of present mandatory price floors between 75 percent and 90 percent of parity. The latter has been recommended in off-record sessions by some of Secretary Benson's advisers, but it is doubtful the USDA boss will recommend to the Democratic Congress any radical change in present price-support policy.

Nor is it likely that Congress will make a really serious effort to restore 90 percent props. Any such legislation, if passed, faces almost certain death by veto.

Perishable commodities that encounter serious price trouble will be purchased by the government, but with more reluctance than last election year. Almost all buying programs started last fall, meantime, have been ended by USDA, including purchases of hamburger, turkeys, eggs, and lard.

• 1956 Cotton Value $2,444,053,000

COTTON ranked second to corn in USDA's December estimate of crop values, which includes value of all production and not cash sales, alone. Cotton and seed from 1956 plantings were valued at $2,444,053,000, compared with $2,648,293,000 in 1955.

Roy B. Davis Re-elected

Roy B. Davis, general manager, Plains Cooperative Oil Mill, Lubbock, has been re-elected to his third three-year term as a director of the Houston Farm Credit Board.

• Harvey Retires As Southern Manager

T. M. HARVEY, who has been with Southern Cotton Oil Co. since Aug. 1, 1911, and manager of the mill at Decatur, Ala., since 1925, is retiring on Jan. 1. He will continue to serve the firm in an advisory capacity.

J. S. Long, district manager for Southern, has announced that John R. Laughlin, formerly manager of the Cullman mill, succeeds Harvey. S. F. Hosey, manager of the mill at Birmingham until it was closed last fall, has been transferred to Decatur as assistant manager.

Entomologists To Meet

Mississippi's 1957 control recommendations will be announced at the third Mississippi Insect Control Conference Jan. 10-11 at Mississippi State College. The annual meeting of Mississippi Entomological Association will be held at the same time.

Kemp and Morgan Promoted By Continental Gin Co.

Nelson J. Kemp was named vice-president in charge of finance and George C. Morgan vice-president in charge of the industrial division of Continental Gin Co. by the board of directors at a recent meeting.

Kemp, a native of Erie, Penn., and

GEORGE C. MORGAN

graduate of the University of Pittsburgh, became controller for Continental Gin Co. in 1948, after having been with Cooper Bessemer Corp. and De-Laval Steam Turbine Co. In 1951, Kemp was elected treasurer of Continental, which position he continues to hold.

Morgan is a native of Ozark, Ala., and graduate of Alabama Polytechnic Institute. He joined Continental in 1936. He organized the oil mill division, serving as manager until 1941, when he organized and became manager of the war contract department. This department in 1945 was reorganized as the special products division and managed by Kemp until last Feb. 1, when he was named manager of the industrial division.

• Irrigation Offsets Record Drouth

IRRIGATION WATER enabled the area around Hearne, Texas, to produce a record 1956 cotton crop despite the worst drouth year in history, says J. Howard Fox, manager, South Texas Cotton Oil Co., Hearne. Fox was quoted in a recent feature story in the Waco Times-Herald, received by The Press from Oscar Robinson of Austin.

J. HOWARD FOX

The article said, in part:

The farmers along the Brazos River south of Hearne, most of them of Italian descent, were pioneers in the practice of irrigation. Now they have become past masters at it.

They began in 1948 when Pete Trentecost drilled a 60-foot well with a four-inch pipe to water a small garden where he grew vegetables for his grocery store.

Carelessly, some of the water spilled out and flooded two rows of his adjoining cotton field.

Trentecost and his neighbors cursed his luck at ruining two rows of cotton—long considered a dryland crop—in a year when the rain had been just right and a good harvest expected.

But as the season wore on the two ruined rows continued to flourish, and when picking time came around they out-produced the rest of the field.

It didn't take these ingenious and progressive men long to catch on.

Farmers this year flooded their fields four and five times; and some are producing three to four bales to the acre. The average is better than two bales per acre.

Farmer-ginner Frank DeStefano is producing 335 bales on 165 acres, said if the dryland farmers had received normal rainfall "the gins wouldn't be able to handle all the cotton."

As far as the cotton oil business is concerned here, Fox said his firm has not even felt the drouth.

Contrariwise, it is the best year he can remember.

In the 12 miles from Valley to Junction to Mumford along the east bank of the Brazos south of Hearne about 12,000 acres are under irrigation, about 7,000 of them in cotton under the allotment program.

Easily 95 percent of the irrigation is done by wells at depths of 60-65 feet. The rest pump their water out of the Brazos, kept flowing throughout the year because of Possum Kingdom and Whitney Dams 375 river miles away.

And more and more acres are being leveled, more and more wells dug. There are about 250 wells in the area this year—about 50 more than last year.

Farm Organizations Have New Affiliation

Officials of the Big Three general farm organizations have affiliated themselves with a new organization known as Farmers in World Affairs. The purpose of this venture is to serve as an educational vehicle for U.S. farmers in matters relating to international affairs. Another function is to stimulate and interest rural people in participating in activities of international good will and understanding in the interest of peace.

Included on the board of directors are individuals from the Farm Bureau, the Grange, the Farmers' Union and the Friends' Service Committee. Edward F. Holter, program specialist for the National Grange, is president of the new group, and Ray Newton of the Friends' Service Committee is executive secretary.

The first major activity of Farmers in World Affairs will be a four-day institute at the Kellogg Center, East Lansing, Mich., Feb. 24-28, 1957. Information may be obtained from Ray Newton, executive secretary, 1201 Chestnut St., Philadelphia, Pa.

1957 Cotton Production in Mexico Poorest in Years

A survey by USDA indicates that Mexican cotton production in 1957 will fail to reach the 1,700,000 bales produced in 1956, and may fall more than one-half million bales below the peak production of 2,200,000 bales in 1955.

Department specialists, Frank D. Barlow, Jr., and Grady B. Crowe, report, however, that assuming improvement in water reserves over the next five to 10 years, Mexico has a feasible production potential of up to 2,500,000 bales.

Cox, Oil Chemist, Dies

Charles H. Cox, widely-known vegetable oil chemist, died recently in a Houston hospital. He was associated with Barrow-Agee Laboratories of Memphis from the time the firm was founded until his retirement in 1951. He is survived by his wife, four sons, a sister and five grandchildren.

Mill Resigns From NCPA

McAlester Oil Mill Co., McAlester, Okla., has resigned from membership in National Cottonseed Products Association because the mill no longer crushes cottonseed.

Two New Gins Planned

Plans to build two new gins in the Tulare Lake area south of Corcoran, Calif., have been announced by J. G. Boswell Co.

Western Cottonoil Issues Paymaster Farm Facts

Paymaster Farm Facts is the name of a new publication being sent to friends and customers by Western Cottonoil Co. The initial issue contains a message from Ben R. Barbee, Abilene, general manager, explaining that the publication is designed to bring to its readers new and improved methods of increasing production efficiency.

"Four Keys to Profitable Farming"—soil, water, insecticides and fertilizer—are discussed in the first issue.

Cotton Producers Meet

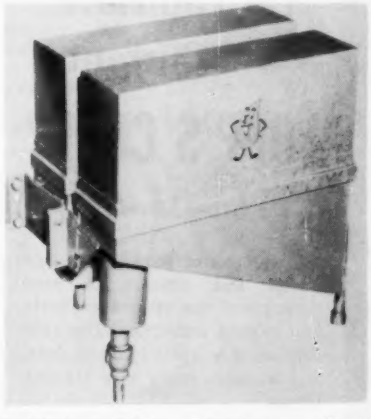
American Cotton Producer Associates favored continuation of the cotton export program at their Dec. 21 meeting in Memphis. Other action included opposition to lowering of the support price, endorsement of textile import limitations and opposition to ending of non-recourse loans.

■ **JOHN L. ANDREAS has been appointed assistant to the president of Central Soya Co. and McMillen Feed Mills, Fort Wayne, Ind.**

New Product

DUAL RESERVOIR ATTACHMENT FOR LIQUID SEED TREATERS

Two different seed treating chemicals may now be applied simultaneously through use of an inexpensive Dual Reservoir attachment recently announced by Panogen, Inc. It was developed so that two physically incompatible materials could be applied at the same time without mixing before they reach the seed. This permits the seed processor to apply Drinox, a



liquid insecticide, and Panogen liquid seed disinfectant with a single trip through the treating equipment.

Another time-saving feature is that one reservoir may be used to hold a chemical, such as Panoran, Arasan, Spergon and Captan, for slurry treatment of corn or beans, while the other holds a liquid fungicide, such as Panogen, for treatment of small grain. The operator can switch from one tank to the other almost instantly without losing time for cleaning and change-over, the manufacturer states.

For further information, write Panogen, Inc., Ringwood, Ill., or any Panogen distributor.

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• Program Committees Named by Council

PROGRAM COMMITTEES of the National Cotton Council for 1957 have been named by Col. Francis J. Beatty, Charlotte, N. C., president. They will study proposals for research and promotion and make recommendations to the Council's delegates at the annual meeting at the Sheraton-Jefferson Hotel in St. Louis, Jan. 28-29. Committees are:

• **Production and Marketing** — Cecil H. Collerette, Casa Grande, Ariz., chairman; J. D. Hays, Huntsville, Ala., vice-chairman; Harry S. Baker, Fresno, Calif.; N. C. Blackburn, Memphis; A. B. Emmert, Danville, Va.; A. W. Fisher, Kannapolis, N.C.; W. R. Flippin, Memphis; P. E. Harrill, Oklahoma City; J. H. Henry, Melrose, La.; J. F. McLaurin, Bennettsville, S. C.; George M. Powell, Memphis; C. R. Sayre, Scott, Miss.; Max C. Smith, San Marcos, Texas; Henry McD. Tichenor, Monroe, Ga.; and Adolph Weil, Jr., Montgomery, Ala.

Advisory—Ben R. Barbee, Abilene, Texas; Eugene Butler, Dallas; Otto Goedecke, Hallettsville, Texas; M. Earl Heard, Shawmut, Ala.; J. R. Kennedy, Bakersfield, Calif.; J. Winston Neely, Hartsville, S.C.; and R. Flake Shaw, Greensboro, N.C.

• **Sales Promotion** — J. Craig Smith, Sylacauga, Ala., chairman; W. B. Coberly, Jr., Los Angeles, vice-chairman; G. C. Cortright, Jr., Rolling Fork, Miss.; G. E. Covington, Magnolia, Miss.; W. L. Gatz, Jr., Paragould, Ark.; C. A. Harvin, Jr., Summerton, S.C.; Marion W. Heiss, Greensboro, N.C.; J. B. Hubbard, Dallas; C. P. Key, Lodge, S.C.; Sam LaFaver, Watonga, Okla.; B. L. Mallory, Jr., Memphis; J. B. Mayer, Phoenix, Ariz.; Allison H. Pell, Chartlotte, N. C.; J. C. Rapp, McGehee, Ark.; Delmar Roberts, Anthony, N.M. and John W. Walker, Waynesboro, Ga.

Advisory—Arthur B. Edge, Jr., La Grange, Ga.; H. R. Gill, Evanston, Ill.; Mitchell Landers, El Paso; W. Ralph MacIntyre, Wilmington, Del.; J. M. Reeves, New York; Bernard H. Tholen, New York; and R. E. L. Wilson, III, Wilson, Ark.

• **Utilization Research** — Tom J. Hitch, Columbia, Tenn., chairman; J. M. Cheatham, Griffin, Ga., vice-chairman; Alfred Bessell, Jr., Houston; E. J. Cecil, Fresno, Calif.; Roy B. Davis, Lubbock; Eugene Hayes, Madera, Calif.; Otis W. Howe, Wabash, Ark.; J. L. Hurschler, Pasadena, Calif.; W. A. Joplin, Hayti, Mo.; E. H. Lawton, Hartsville, S.C.; C. W. Lewis, Deming, N.M.; W. Gordon McCabe, Greenville, S.C.; Roger Milliken, Spartanburg, S.C.; D. H. Morris, III, Geneva, Ala.; A. G. Paxton, Greenville, Miss.; Frank S. Pope, Villa Rica, Ga.; Jess G. Stratton, Clinton, Okla.; Marshall O. Thompson, Mesilla Park, N.M.; and C. D. Tuller, Atlanta.

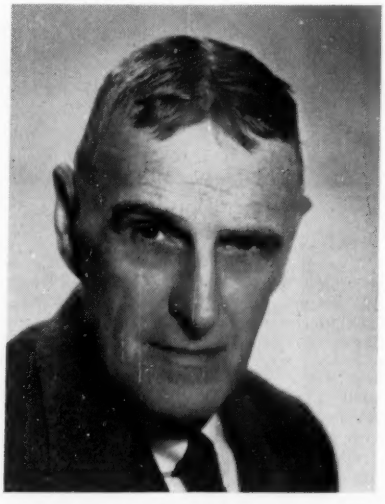
Advisory—Harry B. Caldwell, Greensboro, N.C.; Sydney M. Cone, Jr., Greensboro, N.C.; and H. K. Hallett, Chariotte, N.C.

• **Foreign Trade** — A. E. Hohenberg, Memphis, chairman; Hugo Dixon, Memphis, vice-chairman; Everett R. Cook, Memphis; James S. Francis, Phoenix; F. E. Grier, Greenwood, S.C.; R. T. Hoover, Jr., El Paso; Burris C. Jackson, Hillsboro, Texas; R. H. Jewell, Chickamauga, Ga.; E. G. McKenzie, Jr., Macon, Ga.; E. L. Puckett, Amory, Miss.; Walter L. Randolph, Montgomery, Ala.; Wilmer Smith, Wilson, Texas; J. H. West, Bishop, Texas; S. Y. West, Memphis; and J. Clyde Wilson, Buckeye, Ariz.

Advisory— Marc Anthony, Dallas; D. W. Brooks, Atlanta; C. A. Cannon, Kannapolis, N.C.; W. D. Felder, Jr., Dallas; Lamar Fleming, Jr., Houston, Texas; William A. McGregor, New York; Alan G. Patterson, Jonesboro, Ark.; Howard Stovall, Stovall, Miss.; and J. W. Tapp, Los Angeles.

• **Special Committee on Domestic Trade Barriers** — A. L. Story, Charleston, Mo., chairman; E. H. Agnew, Anderson, S.C., vice-chairman; J. E. Byram, Jr., Alexandria, La.; J. Lindsay Gunn, Shafter, Calif.; C. G. Henry, Memphis; J. V. Kidd, Birmingham; J. D. Lee, Thatcher, Ariz.; Harold F. Ohlendorf, Osceola, Ark.; and Clyde E. Upchurch, Raeford, N.C.

Advisory—E. M. Deck, Sherman, Texas; John F. Moloney, Memphis; Siert Riepma, Washington; and J. P. White, Jr., Roswell, N.M.



Friends To Honor Him

CHARLES A. BENNETT will retire on Feb. 28, 1957. This longtime leader in USDA's cotton ginning research is affectionately known as "Uncle Charlie" throughout the cotton industry. He has received many honors for his contributions to agricultural engineering—including the Cyrus Hall McCormick Medal and the USDA Distinguished Service Award—and his colorful career will be the subject of a sketch in a future issue of The Press.

News of his plans to retire brought immediate requests from his friends in the ginning and allied industries for an opportunity to express their appreciation to Uncle Charlie. To make this possible, Texas Cotton Ginners' Association, 3724 Race Street, Dallas 26, (P. O. Box 7665) will receive checks, made payable to Texas Cotton Ginners' Association, and marked "For C. A. Bennett Fund." Each donor will be listed and the names of the donors will be presented to Uncle Charlie, with an appropriate gift, at a time and place soon to be announced. Friends from all parts of the Cotton Belt have already sent checks, and all desiring to do this should mail their checks to the above address as soon as possible.

• Committees of Texas Crushers Meeting

MANY ACTIVITIES are currently being carried on by officers and committee members of Texas Cottonseed Crushers' Association. They include the following:

The Association's insurance and safety committee met in Dallas Dec. 18 to discuss Texas workmen's compensation laws. Present at the meeting were Ben. R. Barbee, Abilene, chairman; D. B. Denney, Wolfe City, co-chairman; W. C. Smith, Wichita Falls; C. L. Walker, Jr., Temple; Henry Wunderlich, Corpus Christi; Vice-President J. W. Simmons, Jr., Dallas; and Agricultural Director C. B. Spencer and Secretary-Treasurer Jack Whetstone, both of Dallas.

Agriculture, pink bollworm, water conservation and products committees will hold meetings in Dallas on Jan. 7.

Texas crushers again will entertain members of Texas Jersey Cattle Club at the annual meeting in Corpus Christi, Jan. 10.

Members of the public relations committee will meet in Fort Worth Jan. 27 and will be hosts at the awards banquet for the senior college livestock judging teams at the Forth Worth show.

A proposed revised feed law, which has been drafted and endorsed by crushers, other feed groups and the livestock industry, will be introduced at the 1957 session of the Texas legislature.

Two Founders of Supply Firm Die Within Week's Time

Two men who were co-founders of a supply firm 60 years ago and became civic leaders died within a week's time recently in Memphis. They were John A. Riechman and Harry H. Crosby, founders of Riechman-Crosby.

Both men were widely known throughout the cotton industry of the Midsouth, and had many friends who join with The Press in extending sympathy to their families and business accociates.

Riechman leaves his wife; two daughters, Mrs. Mary Louise Driver and Mrs. Lawson Wilhoite, both of Memphis; and five grandchildren.

Crosby leaves his wife, Mrs. Emma Tuther Crosby.

Jehl and Flippin Will Head Memphis Board

Ila Jehl, Jr., of Marianna Sales Co. was recently elected chairman of the board for the Memphis Board of Trade Clearing Association. The association operates the futures market for the Memphis Board of Trade.

Other directors named were: Lee Canterbury of Cargill, Inc.; C. G. Carter, brokerage firm owner; Fred C. Lovitt of Fred C. Lovitt & Co.; and J. W. Phelan of E. E. Buxton & Co.

W. R. Flippin of Buckeye Cellulose Corp., unanimous choice for the Memphis Board of Trade presidency for 1957, will serve as president of the clearing association.

■ **MACK JAMISON has been appointed field representative for the Agricultural Marketing Service Cotton Division in Altus, Okla.**

Research Awards Will Be Presented at Meeting

Presentation of the 1956 Glycerine Research Awards will be made at a luncheon meeting of the Association of American Soap & Glycerine Producers, Inc. The meeting will be held Jan. 7, at the Waldorf-Astoria Hotel, New York. The awards are presented annually for original research on the properties and uses of glycerine or glycerine derivatives. The first award is an honor plaque and $1,000; second, honor certificate and $300; third, honor certificate and $200.

During the afternoon, a meeting of the Glycerine Producers' Association will be held.

• California To Have Cotton Meetings

HARRY THOMPSON, chairman of the California unit of the National Cotton Council, has announced that a series of meetings on Cotton's Problem, Program and Potential will be held in the San Joaquin Valley. The meetings will analyze the facts which will determine whether the total market for U.S. cotton will shrink to eight million bales or rise to 16 million within the next few years.

Council staff members participating will include Carlton H. Power, Memphis; Ed Gillespie, Bakersfield; and Brian Boyett, Phoenix.

Thompson urges that every person who is interested in the future of cotton attend the meeting held in his area. A list of the dates and places for the meetings is as follows:

Jan. 8—2:00 P.M., Auditorium, Farm and Home Advisors' Office, 2610 M St., Bakersfield.

Jan. 8—7:30 P.M., Mettler School Cafeteria, Mettler Station.

Jan. 9—2:30 P.M., Wasco Memorial Hall, Wasco.

Jan. 10—2:00 P.M., Hanford Fraternal Hall Association, Hanford.

Jan. 10—7:30 P.M., Veteran's Memorial Hall, Corcoran.

Jan. 11—2:00 P.M., Memorial Hall, Madera.

Jan. 14—2:00 P.M., Memorial Hall, Tulare.

Jan. 14—8:00 P.M., Sierra Vista School Auditorium, Visalia.

Jan. 15—2:30 P.M., Woodville Elementary School, Woodville.

Jan. 16—1:30 P.M., Tenth Floor Auditorium, San Joaquin Power & Light Bldg., Fresno.

Jan. 17—10:00 A.M., Grange Hall, San Joaquin.

Jan. 18—2:00 P.M.; Men's Service Club, Dos Palos "Y".

Guthion-Exposed Seed Now May Be Crushed

Guthion, one of the newer insecticides, will be widely used in 1957 and is mentioned frequently in the Cotton Production Conference material elsewhere in this issue.

Last season, when this material was used on an experimental basis, oil mills were not permitted to crush cottonseed exposed to it. USDA, with Food and Drug Administration concurrence, has now approved the crushing of seed exposed to Guthion.

Tennessee Will Accept National Feed Rules

Tennessee Division of Feeds, Seeds and Fertilizers has advised National Cottonseed Products Association that registration of cottonseed meal on the basis recommended by the Association of American Feed Control Officials will be tentatively accepted. Guarantees recommended by AFCO are shown in sample labels on Page 91 of NCPA's Rules Book. In the past, Tennessee required higher fat and lower fiber guarantees than AFCO.

We're looking FORWARD TO '57... and the privilege of further serving you...

With best wishes to you for a Healthy, Happy and Prosperous New Year!

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Oil Mill Equipment for Sale

FOR SALE—Complete Delinting Plant consisting of 4-steel Carver linters, Tru-line gummer, cleaning equipment, and flue system. Also 176-saw and 141-saw Carver steel and wood frame linters, miscellaneous separating equipment, conveying and elevating equipment. One complete 100-ton expeller soya bean plant.—Valley Machinery & Supply Co., P. O. Box De Soto Station 2252, Phone JA 7-7935, Memphis, Tennessee.

FOR SALE—To be moved. Complete 1951 model cottonseed delinting plant. Three 141-saw Continental all-steel linters, condensers, bucket elevators, dust flue system, drop bottom conveyors, Clipper super seed cleaner, Gustafson slurry type seed treater, 36-saw gumming machine and 75 h.p. electric motor. This plant has delinted less than 1,500 tons of cottonseed.—J. D. Elliott & Son, Athens, Alabama.

FOR SALE—Allis-Chalmers rotary steam drier, meal coolers, Marley cooling tower, Hoffman centrifical blowers, Webster automatic power shovel units, Roots-Connersville blowers, heat exchangers, Prater pulverizers, V. D. Anderson expeller parts, scales, pumps, Eureka dust collectors, valves and electric motors. A-1 condition. Contact Lee Atherton, Archer-Daniels-Midland Company, Investor's Building, Minneapolis, Minnesota.

FOR SALE—Anderson Super Duo expellers. Filter presses. 72" and 85" cookers. Butters milling machine. Carver 176-saw Tru-line Gummer. Double box linter press. Attrition mills. Single drum hull beater. 20" to 70" fans. Motors: 75 h.p. and under.—Sproles & Cook Machinery Co., 159 Howell St., Telephone RI7-5958, Dallas, Texas.

INSPECTIONS and appraisal. Dismantle and installation.—Oscar V. Schultz, Industrial Engineering, Phone BUtler 9-2172, P. O. Box 357, Grapevine, Texas.

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150	Sq. Cage	900		1188
100	Slipring	1200		1076
100	Slipring	900		1189
100	Sq. Cage	1200		758
100	Sq. Cage	900		879
75	Sq. Cage	1800		490
75	Slipring	1200		889
75	Slipring	900		991
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50	Sq. Cage	1800		290

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OIL MILL EQUIPMENT FOR SALE — Rebuilt twin motor Anderson high speed expellers, French screw presses, stack cookers, meal coolers, fourteen inch conditioners, filter presses, oil screening tanks, complete modern prepressing or single press expeller mills.—Pittock & Associates, Glen Riddle, Pa.

FOR SALE—Filter presses; screening tanks; single and twin motor Anderson Super Duo expellers, with conditioners; several extra 36" cooker dryers and conditioners. All steel linter baling presses; 141-176 saw linters; seed cleaners; No. 153 separating units; bar hullers; lint beaters; stack cookers; rolls; hydraulic press room equipment.—V. A. Lessor & Co., P. O. Box 108, Fort Worth, Texas.

Gin Equipment for Sale

FOR SALE—Government type tower driers, automatic gas heaters, blow pipes, and fittings. We are prepared to deliver and install driers, and any gin machinery in conjunction with drying equipment.—Service Gin Co., P. O. Box 21, Phone 4251, Ville Platte, Louisiana.

FOR SALE—4-80 Murray gins, complete with lint flue and conveyor distributor, 16' 2-15/16" stub shaft and bearings all in first-class shape. —John Matyastik, Route 3, Rosebud, Texas.

FOR SALE—One Moss-Gordin lint cleaner, constellation model. The machine has been in operation for one season with 1,150 bales ginned. Please contact J. T. Ragan, Coolidge, Texas.

SPECIAL BARGAINS—To be operated at location in Central Texas territory, one complete gin plant consisting of five latest model 80-saw Murray gins with Super Mitchells, Murray conveyor distributor, 70" and 72" overhead cleaning equipment with 14' Hardwicke-Etter steel bur machine, all practically new, 24-shelf tower with three million BTU Mitchell heater, electric and diesel power, new Moss-Gordin lint cleaner, large seed house and cotton house and approximately two acres of land, all complete and operated this season. During the last three dry years, this plant has averaged 2,000 bales per year and easily has a potential of 4,000 bales per year, during normal rainfall season. This plant will carry a 75 percent loan of sales price to qualified and responsible party. Write, wire or call us for price and details. In addition, we offer a complete 4-80 latest model Murray gin plant with Super Mitchells, Mitchell conveyor distributor, 14' Hardwicke-Etter steel bur machine, Hardwicke-Etter cleaner and other excellent items of machinery at an unusually attractive price. In Waco stock: 60" and 66" Super Mitchells, 7- and 9-cylinder Hardwicke-Etter 50" cleaners, 12- and 16-cylinder 52" Stacy cleaners, 48", 50", 70" and 72" steel separators, several press pumps including Hardwicke-Etter back-geared pump mounted on steel fluid tank with automatic lubrication and 15 h.p. motor with V-belt drive. New Government type towers, new and used fans and transmission equipment and hundreds of other excellent items for your choice selection. For the largest, oldest and most reliable source of used and reconditioned gin machinery, contact us. Qualified graduate engineer to assist you with any of your machinery problems at no obligation. Call us regarding any machinery or complete plants you have for sale or trade.—R. B. Strickland & Co., 13-A Hackberry St., Telephones: Day 2-8141, Night 3-7929, Waco, Texas.

FOR SALE—One 3-80 saw Lummus DM complete gin equipped as follows: MEF feeders; 17-shelf tower drier, oil fired furnace; one Lummus inclined cleaner; one Lummus 10' hull separator with grids; one set Lummus square seed scales; 1-48" all-steel Lummus condenser; one all-steel Lummus press, down-packing with 10" ram; one all-steel building, quonset on top of Stran Steel. If interested contact The Cotton Gin and Oil Mill Press, Box OA, P. O. Box 7985, Dallas, Texas.

FOR SALE—4-80 slightly used 1947 Model Murray submerged type lint flue gins with submerged lint flue and side discharge condenser. — Bill Smith, Phones: 4-9626 and 4-7847, P. O. Box 694, Abilene, Texas.

FOR SALE—All-steel, down-packing Continental press complete with long stroke tramper, less pump. Memphis, Tennessee, District.—Box PR, The Cotton Gin and Oil Mill Press, P. O. Box 7985, Dallas, Texas.

FOR SALE—Cotton gins, oil mills, compresses. Contact M. M. Phillips, Phone TE 5-8555, P. O. Box 1288, Corpus Christi, Texas.

FOR SALE — Lint cleaners: 2-80 Continentals. Gins: 4-90 Murrays, 5-90 Gullets, 4-80 glass front Cen-Tennials, 6-80 glass front Murrays, 1-80 Model E brush, 1-80 1949 Lummus, 3-80 Model C Continentals, 5-70 Model C Continentals, 5-70 Lummus, 1-80 Hardwicke-Etter. Feeders: 6-60" Super V-drive Mitchells, 6-60" MEF Lummus, 5-66" Special Standard V-drive Mitchells, 5-60" Special Standard V-drive Mitchells. Driers: 2 Murray Big Reels, one 16-shelf Hardwicke-Etter complete with fan and burner. Cleaners: One 5-cylinder V-drive Hardwicke-Etter, two 4-cylinder Continentals. Condensers: 1-48" Continental side discharge, 1-48" Hardwicke-Etter side discharge, 1-36" Continental side discharge. Separators: 3-72" Murrays, 1-72" Lummus, 1-52" Murray. Engines: One 12-cylinder 425 h.p. Le Roi, one V-8 280 h.p. Le Roi, one 6-cylinder 240 h.p. MM, one twin six 210 h.p. MM. Various size electric motors.—Bill Smith, Phones: 4-9626 and 4-7847, P. O. Box 694, Abilene, Texas.

FOR SALE—One Continental all-steel press, one Murray Big Reel dryer, one 50" Hardwicke-Etter dropper, 5-80 saw Hardwicke-Etter stands and feeders.—R. W. Kimbell, Box 456, Earth, Texas.

FOR SALE—Four-cylinder Mitchell pre-cleaner, Murray '50 and '51 model lint cleaners, two Murray rebuilt 24-shelf tower driers, 14' steel Murray bur machine completely rebuilt all new saw drum cylinder, brush cylinder, and directional cylinders, 52⅝" Murray separator and vacuum dropper complete, new Hardwicke-Etter short stroke tramper complete with kicker and charge box, Lummus one-story down-packing wood press complete with tramper, Cen-Tennial tramper, EJ tramper, Continental ram and casing, 2-80 saw Murray bolt suction gin stands, one double auger, 3-80 Cen-Tennial conveyor distributor, left hand, 6-cylinder horizontal Murray cleaner on "V" drives, 72" Continental separator complete with vacuum, two 1-M Mitchell burners, three #30 Mitchell vaporizers, three 72" 7-cylinder Murray type incline cleaners complete with vacuum fronts, one 35" Sturdivant fan with multiblade, one 40" Murray fan. All equipment priced to move.—Wonder State Mfg. Co., Paragould, Ark.

FOR SALE—One Continental 5-stand gin, 1955 model 18-shelf drier with burner, 12' Murray all-steel bur machine with six-drum cleaner, four electric motors and blow box with all connections. Will sell any part.—G. A. Wolman, Caldwell, Texas.

Equipment Wanted

WANTED—One Hardwicke-Etter 10' bur machine, one 72" Hardwicke-Etter separator, one 6-cylinder 72" Hardwicke-Etter cleaner. All steel.—T. C. (Jack) Dempsey, Rt. 1, Lockney, Texas.

WANTED—300 h.p. diesel or butane engine for cotton gin; also one 1953 90-saw Murray safety gin, one 1953 Mitchell Super Chief feeder, and one 1955 Murray saw-type combing lint cleaner. —Datto Coop Gin, Datto, Arkansas.

WANTED—All makes and kinds of good used gin machinery. State model and name of equipment, as well as price, in first letter.—Bill Smith, Phones: 4-9626 and 4-7847, P. O. Box 694, Abilene, Texas.

Personnel Ads

MEN WANTED—Oil mill superintendent and other production supervisors with experience in pre-press solvent extraction. Several jobs open, 25 to 40 years age, Mechanical or Chemical Engineering degrees desirable though not required in lieu of sufficient experience and ability. All replies kept confidential. Write Ike Friedman Employment, 718 Falls Bldg., Memphis, Tenn.

Power Units and Miscellaneous

FOR THE LARGEST STOCK of good, clean used gas or diesel engines in Texas, always see Stewart & Stevenson Services first. Contact your nearest branch.

FOR SALE—Power units: 139 h.p. Le Roi D-1000, $1,000; 671 GMC, 130 h.p., $2,000; RX1SV Le Roi, 400 h.p., $5,000; 75 h.p. RPM Westinghouse electric motor, $500.—Wonder State Mfg. Co., Paragould, Arkansas.

FOR SALE—Reconditioned cotton ties, whole, butt welded, riveted, standard bundles with buckles attached, also compress ties to specifications. Fifteen years experience reworking cotton ties. We can save you money on cotton ties. Reply to Chapwel Mfg. Co., Box 440, Anderson, S.C.

FOR SALE—One rebuilt Model NEU 8 x 9, 6-cylinder Minneapolis-Moline engine, natural gas or butane.—Fort Worth Machinery Company, 913 East Berry Street, Fort Worth, Texas.

FOR SALE—12-cylinder Le Roi natural gas or butane engine, 340 h.p. continuous—$3,500. Memphis, Tennessee, District.—Box HB, The Cotton Gin and Oil Mill Press, P. O. Box 7985, Dallas, Texas.

• Irrigation Ups Cotton Yields

IRRIGATING HIS COTTON crop paid off for Fay Holt, Obion County, Tenn., farmer, according to H. W. Luck, assistant Extension agronomist. "It was very dry in Mason Hall Community last summer," Holt reported, "but the drouth did not keep us from making 1,055 pounds of lint cotton per acre on our 18-acre field. By using our sprinkler system, we increased the yield by one-half bale or more per acre."

Holt irrigated three times, applying 1.5 inches of water each time. Irrigation was begun about one week after blooming started.

Fertilization consisted of applying 150 pounds of 60 percent potash and 150 pounds of 60 percent phosphate at the time of seedbed preparation, and 200 pounds of 10-20-20 at planting time. The cotton was sidedressed with three applications of ammonium nitrate totaling 250 pounds.

Holt says that a profit can be made in growing cotton with yields such as he obtained on his irrigated cotton.

Spiny Bollworm in Israel Reduces Cotton Crop

The latest estimate of the 1956-57 cotton crop in Israel indicates that production will drop to about 16,000 bales (500 pounds gross) as a result of large scale infestation by the spiny bollworm. This insect has also impaired the quality of the cotton.

Earlier estimates of the crop had been for production of about 22,000 bales. Measures taken to fight the infestation reportedly were for destruction of cotton on approximately 1,000 acres in the affected areas, reports USDA.

Robert Edgar Swingle Dies in Dallas

Robert Edgar Swingle, Dallas, longtime representative of Beltraction Co. who had many friends among ginners of the Southwest, died Dec. 27. Funeral services were held in Dallas on Dec. 28.

He is survived by his wife; daughters, Susan and Judy Swingle and Norma Kinder, all of Dallas; and a sister, Mrs. W. E. Fowler, Cranford, N.J.

Buxtons with New Firm

E. E. Buxton & Co., Memphis, is discontinuing its brokerage business on Dec. 31. J. S. Buxton and W. E. Buxton, partners, are joining the firm Mitchell, Hutchins & Co. and opening Memphis offices at 113 South Court about March 1. Until then, business will be conducted at the present location of the Buxton firm in the Cotton Exchange Building.

Pest Attacks Soybeans

Midsouth soybean growers are concerned over the appearance of a relatively rare pest, the soybean cyst nematode. USDA and Tennessee authorities are studying quarantine and control measures.

The nematode also has been found in Missouri.

Task Groups To Meet

Special task groups named to study increased industrial uses of farm products have scheduled meetings for December and January. These include: New and special crops group, Dec 17-18 in Washington, and again on Jan. 3-4; poultry and poultry products, Jan. 3-4 in Chicago; and oilseeds and animal fats group, Jan. 3-4 in Chicago.

Soybean Futures Volume Again Ranks First

Soybeans continued to lead all commodities in futures trading during the past fiscal year, USDA reports. Total commodities trading value of $40.1 billion in the year ended June 30, 1956, was up 2.8 percent from fiscal 1954-55

Value of soybeans futures trading on all markets was $14.7 billion in 1955-56, followed by wheat $8.6 billion, cotton $6.6 billion, corn $3.8 billion, eggs $2.5 billion, and soybean oil $1.1 billion.

Increases in soybeans, wheat, and corn were limited as compared with 1954-55, and there was a sharp decrease in cotton futures trading.

Soybeans Disappointing

Disappointing results with soybeans in Arizona during the past season have discouraged growers, reports Arizona Farmer-Stockman, and acreage is likely to be reduced in 1957. Plants made good growth but bean yields were poor.

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Production Conference

(Continued from Page 37)

worm control. Research workers have turned up a nematode which carries bacteria that are deadly not only to pink bollworms, but also to boll weevils. The nematode can easily be reared in vast quantities on wax moth larvae. It can be stored indefinitely in a cool water solution. It can be sprayed on plants or crop residue, and apparently still be able to seek out and destroy the pink bollworm and the boll weevil.

This is, at present, just a possibility. No one knows where it might lead. It might lead up a blind alley. On the other hand, it might lead to dependable, low-cost control of the pink bollworm—and that pest which now destroys more cotton than all others put together, the boll weevil. Certainly it's a possibility that we can't afford to ignore.

Another such possibility involves genetics and plant breeding. It centers on the question of whether we can develop new cotton varieties that will deny pink bollworm moths a vital source of food.

Life history studies have pretty well nailed down the fact that extrafloral nectar of cotton is a vital food for adult pink bollworms. Denying them this nectar virtually eliminates the laying of eggs.

So, think what it would mean if we had cotton varieties with no extrafloral nectaries! The cotton plant itself might have a built-in ability to keep pink bollworm numbers to a low level. We might be able to eliminate pink bollworms entirely.

Here again, we don't know how this possibility might pan out. But we do know there are wild cottons that are devoid—or practically devoid—of extrafloral nectaries. If this characteristic could be worked into commercial varieties of cotton, we might have the solution to the whole pink bollworm problem.

What I am trying to say here is simply this: We've made a wonderful start in the expanded research program; we've built it up to a level approaching true adequacy; and we've got to make sure that it reaches and stays at an adequate level in the years ahead.

• **Financial Support Critical** — As of this fiscal year, we reach a critical point in financial support for the expanding research program. When we launched the expansion in 1952, it was agreed that the cotton states and the cotton industry should make contributions on an emergency basis over a five-year period. This they have done. But by mid-1957, their commitments will be fulfilled. We have been anticipating that, by then, USDA will be in position to take over almost all of the financial responsibility for the program. It's likely that Texas, as the most heavily infested state, will continue to allot a substantial sum for pink bollworm research. It's also possible that some other states may want to maintain a degree of financial participation by contributing through their regional research fund. But USDA is in a unique position to accept primary responsibility for the program. And, according to the best estimates available, it seems that USDA's appropriation for pink bollworm research in fiscal 1958 should be about $100,000 higher than in 1957. If it isn't, some important lines of work may have to be neglected.

None of us want this to happen. We can help keep it from happening by giving full support to the effort to obtain adequate USDA appropriations for pink bollworm research.

We must see to it that there is no drastic curtailment in this program which has already paid such good dividends—and which promises far richer dividends in the years ahead.

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What We Know About Defoliation

DR. R. O. THOMAS, Plant Physiologist, USDA, Delta Station, Stoneville, Miss.

Ten years' results in comparing present defoliant chemicals reveal that each may have certain advantages and limitations, depending on plant condition, weather, and application method.

Calcium cyanamide, the first cotton defoliant used, is an excellent defoliant when plants are well matured, yet active, and dews are adequate. A new dust formulation containing sodium chlorate appears equal to cyanamide, except perhaps in spreading quality because it is a heavier dust. Spray defoliants, containing sodium chlorate and borate mixtures or magnesium chlorate, have become the predominant materials used in the irrigated West and Southwest and have received widespread use in the Midsouth since the drouth conditions beginning in 1952 and prevailing in 1953 and 1954. Their use is preferred where conditions favor spray applications to dust. Potassium cyanate, endothal, and sodium ethyl xanthate have not proved to be as reliable since satisfactory results seem rather critically dependent upon plant or weather conditions. Butyne diol, tested extensively since 1953, has given its most satisfactory performance in the Southeast where plants tend to be succulent and a comparatively mild defoliant works best.

A principal shortcoming of present defoliants is the inability to remove late season, immature leaves which too often remain to increase the foreign matter content and green stain of the harvested cotton. Considerable promise in this direction has appeared in the development of the chemical, amino triazole. When applied either alone or in combination with other defoliants, this material has demonstrated defoliant ability, and in most cases it retards the development of regrowth foliage which often appears following defoliation.

Two new experimental defoliants, known presently by the manufacturer's code designations as Chemagro's B-1776 and Virginia-Carolina's 1-186, have been tested for two seasons in the field and have performed well under diverse conditions.

• **Desiccants** — Desiccant materials, which repidly kill and dry up all plant parts with usually only a small amount of defoliation, have been found suitable for pre-harvest treatment of cotton in areas where defoliants seldom give satisfactory results.

The current commercial desiccant formulations contain pentachlorophenol, sometimes fortified with 2,4-D-like chemicals, and are usually applied in diesel fuel.

One of the most frequent causes of failure to obtain satisfactory defoliation is faulty application. Research has shown that airplanes can obtain adequate coverage with spray defoliants on plants up to four and one-half feet in height with applications of five to seven gallons per acre when swath width does not exceed wing length. However, if plants are taller and foliage is dense, or if plants are badly lodged and foliage is matted, higher rates or split applications may be necessary. Good spray coverage has been obtained with ground machines applying 15 to 20 gallons per acre where plants are no more than four to four and one-half feet high and the foliage is relatively open.

Although shielded tractors have been used, the loss of cotton knocked out on the ground has been minimized with the development of high clearance spray machines.

• **Three Inter-Related Aspects** — Three aspects of defoliation are so inter-related that it is difficult to consider them separately. These are (1) *Benefits*, (2) *timing*, and (3) *economic appraisals*.

Recent studies have related time of application to percentages of open bolls ranging from 30 to 90 and have measured the effects on factors involved in machine harvesting as well as on quantity and quality. These studies have been conducted during the past two seasons when dry weather during late August and all of September resulted in considerable natural defoliation and rapid opening of bolls. Consequently the additional leaf drop resulting from chemical applications did not materially increase rate of boll opening. However, defoliation at 55 percent open bolls did permit picking of 88 percent of the machine harvested crop 12 days following application. No significant timing effects were found in terms of total yield or efficiency of picker operation. Measurement of certain seed and fiber properties in seed cotton from bolls tagged on day of flowering showed decreases in one or more of the quality

factors in bolls younger than 35 days age at time of defoliant application. These reductions were most pronounced in applications at 30 percent open bolls and, in most cases, disappeared or were of little consequence after 60 to 65 percent of the bolls had opened before the defoliant was applied.

• **Effects** — What about the effects of defoliation on harvesting operations, yield, trash content and grade?

A summary of nine years' cotton mechanization studies in Mississippi shows only slight improvements in picker efficiency and grade. Alabama found that foreign matter content of seed cotton harvested with spindle pickers was 11.1 percent in undefoliated plots and 7.3 percent in defoliated plots. Yet no benefits in grade were realized. A three year study in California has shown no real benefit from defoliation in terms of picker efficiency, yield, lint value, or cash value of the crop.

Economic appraisals of defoliation have been made over a three year period at several locations in Mississippi, under a wide range of plant conditions. At several locations defoliation caused a material reduction in foreign matter content of seed cotton as it went to the gin. However, these differences were shortly reduced by the time the cotton reached the gin stands, and became negligible in the ginned lint. It should be stressed that these locations were selected where *modern* gins were available.

Economic studies indicate that defoliation can result in a monetary gain when conditions are characterized by rank growth, heavily fruited cotton, maturing in the presence of adequate moisture. In contrast, the cost of defoliation may represent a loss when plants are small, drouth-stressed, with a high percentage of natural leaf drop.

Premature applications reduce yields and lower quality of the latter portion of the crop. A very dry picking season reduces the likelihood that defoliation will yield economic benefits.

On the other hand, occurrence of rains during the harvest period, conditions conducive to boll rot, and low rates of natural defoliation all tend to increase the potential benefits from defoliation.

Now let's take a brief look at the major cotton producing areas in which this general picture is altered by local weather and cultural practices.

In the Southeast, frequency of humid conditions at harvest time makes defoliation important in controlling boll rots and in facilitating mechanical harvesting operations. Foliage is easily removed with the milder acting types of defoliants such as cyanamide dust and NP 1098 (butyne diol). Comparatively early maturity and late August rains sometimes result in a flush of regrowth prior to defoliation which is not readily controlled with the prescribed rates of amino triazole.

In the Midsouth the picture varies drastically from southern to northern extremities of this area. In lower Louisiana the wide-spaced planting of cotton results in very rank growth. If defoliation is accompanied by August showers, a rapid growth of barnyard grass is shaded out. The weed control problem is also intimately associated with defoliation practices where supplemental irrigation is used in the Mississippi Delta. The crop is frequently laid by prior to the last irrigation, following which grasses and vines may grow so profusely that they present a greater obstacle to mechanical harvesting than the cotton leaves. There is an urgent need for some combination of late season weed control and defoliation practices which will keep such fields clean at harvest time. Bottom defoliation may well be the answer to this situation, but has not been explored sufficiently in the Midsouth.

In Missouri the problem of regrowth is minimized where proper timing of supplemental irrigations is carried out. However, adjoining non-irrigated plots have had heavy regrowth when September rains followed a dry August. Amino triazole may be of questionable benefit for controlling regrowth because of the likelihood of frost early in October.

There is a definite trend today toward restricting cotton production to the most fertile soils and using high rates of nitrogen fertilization, together with supplemental irrigation, to produce maximum yields on minimum acreage. This combination tends to produce more and more of the rank, succulent, heavily fruited type of plant in which defoliation for machine harvesting yields its greatest rewards. Ironically, it is this very condition which all too often does not respond readily to our present defoliants.

Defoliation in Texas has become an intimate part of insect control practices, permitting earlier harvest prior to plow-up deadlines and reducing emergence of pink bollworm moths. In the Texas Blacklands, and the Central and High Plains areas of Texas, cotton fails to respond satisfactorily to defoliants, and the desiccant type chemicals are more ideally suited for preparing plants for stripper harvest. Some promise is shown in materials such as Phillips 713, which can result in a fair degree of defoliation, with the remaining leaves dried up for stripper operation. Applications are made when the crop is 90 percent open and 10 days before stripping. This permits earlier harvest without waiting for frost, thus escaping the likely damage to the crop from winter northers.

In Oklahoma, the chlorates are the best defoliants for general conditions. Amino triazole has not proved advantageous, and if occasional regrowth appears, it is treated with a desiccant.

Defoliation is becoming standard procedure in the rank, high yielding crop produced in Arizona. Bottom defoliation, when bolls in the sprayed zone are 35 to 40 days of age, has resulted in the reduction of losses from boll rots and degree of lodging. Ground machines are used for making bottom applications, while final applications are customarily made by airplane. Timing final applications usually represents a compromise between the time which is safe for late set bolls and a time when the plant is still active.

Defoliation is of little use in the northern cotton area of California, where every growing day until frost is needed. Elsewhere in California, growers are learning better control of irrigation regimes which will bring their crops to full maturity in a condition which responds readily to applications of defoliants.

Three developments would materially brighten the future for defoliation: (1) Discovery of chemicals or combina-

■ Brief . . . and to the Point

LON VIAR, who farms near Halls, Tenn., operates a diversified place, with only about a third of his acreage in cotton. However, he is a strong believer in cotton, as indicated by his comment recently in ACCO Press:

> "Cotton is the money-making crop here. I don't know what we'll do if acreage cuts get any worse. Livestock may be the answer, but we need cotton to survive."

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tions of chemicals which can give rapid and complete defoliation and inhibit regrowth in plants which are still growing actively, and also work in late season when temperatures are low; (2) better means for obtaining adequate coverage in rank growth; and (3) better means for weighing losses from late set bolls against gains from earlier harvest of older bolls, which would permit a wiser decision on timing of defoliation.

Basic Research for Better Defoliation Tomorrow

DR. W. C. HALL, Physiologist, Department of Plant Physiology and Pathology, Texas A. & M., College Station.

Further advances in cotton defoliation will largely depend upon our understanding of the basic factors that initiate and control both natural and chemically induced leaf-fall and the regrowth processes.

Perhaps we have already done too much "squirt-gun" research, particularly in the screening of potential defoliants, when cold realism tells us that we are still largely ignorant of what factors and compounds initiate and regulate the course of natural leaf fall.

I can't spell out in any detail the framework of a basic research program today that would lead to better defoliation tomorrow, or even five years hence. I believe, however, that any sound basic research program must be geared to a logical hypothesis. And I would like to present some of the current hypotheses on foliar abscission. Considerable evidence supporting these theories has been obtained with species other than cotton. Except for minor differences, however, there is good reason to believe that the abscission process is basically the same in most dicotyledoneous plants.

• **The Auxin Gradient Hypothesis** — It has been established rather clearly that auxin is a key factor in the prevention of leaf drop. One of the recent advances concerning the roll of auxin in abscission has been the provocative hypothesis that explains abscission in terms of an "auxin gradient." This theory rests on the premise that auxin is "the principal endogenous regulator of abscission" and proposes that the onset and rate of abscission are regulated by the auxin gradient across the abscission zone. According to the theory, abscission does not occur when the gradient is high on the potiole side and low on stem side of the abscission zone. Abscission occurs when the gradient becomes gentle or disappears and is accelerated when the gradient is reversed.

Scientists have conducted experiments on auxin and the auxin gradient in leaf abscission of cotton. Auxin was extracted from the blades, petioles, and stems sampled at intervals until 145 days of age at the tenth nod. Auxin decreased sharply in all organs from 75 days of age to 95 days of age, but throughout the season more auxin was consistently found in the stem than in the blade or petiole. Preceding abscission on the one-hundred and fifty-third day, petiole auxin fell to zero while blade and stem auxin increased. The stem auxin appeared to come from intact leaves higher on the stem. Abscission was preceded by lowering of the auxin gradient.

Research this year in Mississippi emphasizes the importance of the auxin gradient in the abscission process. It was noted that excessive nitrogen fertilization of cotton fields in the Yazoo-Mississippi Delta reduced final percentage defoliation under conditions where other environmental factors do not adversely affect growth. Therefore, by varying the nitrogen supply from 0 to 150 pounds per acre of anhydrous ammonia prior to planting, the final percentage of defoliation was varied from excellent to poor, and this was correlated with the auxin gradient across the abscission zone at time intervals following the application of 20 pounds per acre of calcium cyanamide.

Prior to defoliant application, approximately four times more auxin was present in the proximal stem tissue than in the distal petiole tissue. Twelve hours after application, however, the distal tissue auxin was reduced in all treatments while the proximal auxin remained essentially unchanged. In the controls which gave excellent defoliation, the ratio of proximal/distal auxin changed from four to 218 within 60 hours. As defoliation decreased due to increasing nitrogen supply, the ration changed only from five to eight, three to five, and four to three nitrogen levels, respectively.

• **The Auxin Concentration Theory** — Another hypothesis, based largely on investigations of leaf abscission in Coleus and bean, stresses the role of auxin in both accelerating and inhibiting the abscission process and concludes that differences in effects of proximal and distal applications are more quantitative than qualitative. In brief, auxins can both inhibit and promote abscission, the controlling factor being the concentration and not the auxin gradient. Scientists have found that low concentrations of auxin can promote abscission whether applied proximally or distally.

Other studies indicated that induction of abscission by proximal applications of auxin is most effective on newly expanded leaves while distal treatments are more effective for induction at a later age.

• **Acceleration by Another Factor** — A recent report from England indicates that as leaves mature and reach senescence, they produce a diffusible substance, (s) capable of accelerating abscission of intact abscission zones of bean. This is indeed provocative. Material was obtained from laminae, petioles, and abscission zones of bean and from the petioles of senescent leaves of evergreen and deciduous species. The diffusate from young expanding leaves had no significant effect, but the promoting effect increased with the age and senescence of the leaf. The material diffused into agar and would accelerate abscission if applied either proximally or distally to the abscission zone of bean. It was concluded that abscission may be controlled not only by endogenous auxins, but also by a factor produced during leaf maturation and reaching a maximum at senescence.

It was recently confirmed that a factor from senescent leaves and fruits greatly hastens the abscission of excised leaf petioles of bean and has a distinct and separate effect from auxin. The promotion of abscission by the factor is additive to auxin when it is present in the optimum concentration for promotion, but the factor had little or no activity in the pea straight growth test. Because auxin would increase abscission when applied to debladed petioles of leaves which had been sprayed with monosodium cyanamide prior to deblading, it was suggested that the effectiveness of chemical defoliants might be the consequence of stimulating the production of this factor.

An attempt has been made to collect the diffusible factor from senescent cotton petioles or debladed cotton petio-

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les which had initiated abscission in two ways: (1) By diffusion into agar; and (2) aqueous extraction of the tissue. The agar was applied directly to debladed cotton cotyledons, and the extract was incorporated into agar or lanolin before application. To date preliminary experiments have not been able to demonstrate any acceleration of abscission in cotton by the diffusate or extract. Apparently, either our techniques are at fault or other interfering substances in cotton prevents the expression of the activity, or the senescent factor is not operating in cotton.

• **Auxin-Ethylene Balance Hypothesis**— After studying the histology of leaf abscission in selected species, scientists proposed the auxin-ethylene regulation of abscission. Other workers have seriously questioned the ethylene part of the hypothesis. The main objection has been that the early methods employed to show that leaves produce ethylene are either non-specific or non-quantitative for ethylene. Two workers summarized their discussion of the auxin-ethylene hypothesis by stating, "It must be tentatively concluded that probably ethylene is not an endogenous regulator of leaf abscission. Rather, ethylene is an interesting type of abscission accelerant which happens to be produced by some fruits during or following ripening."

It still remains to be established that ethylene initiates the events that occur in the abscission zone leading to leaffall. However, new evidence clearly indicates that cotton leaves produce ethylene, and its production is enhanced following the application of chemical defoliants. Also, data show that ethylene induces many of the physiological and structural changes that occur both in natural and chemical defoliant induced abscission. Therefore, at the present time it appears premature to exclude ethylene as a possible participant in the endogenous regulation of abscission.

• **A Modified Hypothesis** — Present data indicate that several critical factors influence the basic mechanism of leaf abscission:

(1) Although excellent evidence has been obtained in supporting the existence of an auxin gradient during both the natural and defoliant induced abscission processes, it does not appear that the auxin gradient *per se* is ample in itself to explain the basic cause of abscission.

(2) Rather, it appears that the auxin gradient across the abscission zone is the natural consequence of the basic mechanism that initiates the abscission process.

(3) The fact that low concentrations of exogenous auxin will stimulate abscission when applied either proximally or distally to the abscission zone and that a decrease in auxin concentration always occurs on the petiole side of the abscission zone when high drop results suggests that the differential auxin inactivating ability of distal *vs* proximal tissue is the critical factor initiating abscission.

(4) Although the diffusible abscission-promoting factor has not yet been demonstrated to exist in cotton leaves, other evidence suggests the possibility that it functions in the auxin inactivating system in a manner analogous to the natural phenolic cofactor.

(5) Recent evidence showing that ethylene is produced by mature cotton leaves and intact plants and that injury or chemical defoliants will further enhance ethylene production indicates that ethylene may be an important factor in the regulation of abscission.

Although it is extremely hazardous to draw final conclusions from preliminary data, unpublished work in our laboratory shows that low contentations suggest that the inactivation of cellular auxin first gives rise to ethylene; this initial production of ethylene further catalyzes its production from cell wall components and eventually leads to separation in the abscission zone.

Putting Dollars and Cents Measurements Into Cotton Research

J. W. FANNING, Head, Agricultural Economics Department, University of Georgia, Athens.

The problem of decision making is becoming of major significance to farmers. They not only have more factors to consider in making decisions, but they also must watch costs much closer.

HAVING TROUBLE WITH
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Many gins receive complaints on the quality of their gin-compressed bales. "They are broken ... below density ... over-tared." This is entirely due to the low moisture content of the cotton and is not the fault of the press. Abnormally dry cotton (below 4% moisture) is so spongy and springy that when compressed to standard density, the usual number of ties will not hold the bale. Unless ginners put *more ties on* or *less cotton* in the bale, the ties often break.

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Farming has become a high cash cost, high risk operation.

Farmers are not only concerned with whether a new practice found through research will work, but also with its costs and how much it will pay when put to work. To what extent can dollars and cents values be placed upon research experiments? Will farmers have confidence in these? Will these dollar values be worthwhile to farmers in the decisions the must make in integrating the new practices into their business?

There seem to be two approaches to this question.

• **Cost Measurements Difficult** — For many research projects, there is no way by which to attach dollars and cents measurements. For example, such experiments as the breeding of a new cotton variety, the development of a new insecticide, the identification of a new hormone, the discovery of a new high analysis fertilizer and the finding of a new use for a product do not lend themselves immediately to dollars and cents measurements. These are basic steps in bringing into being something new that may or may not prove successful. But the research must go on. This is an investment. It is man's quest for understanding and something better.

There comes a time, however, when the new developments must take on economic value. A dollars and cents value must be attached. It is at this point in research that dollars and cents measurements can and should be given research experiments.

To develop a cotton variety which exceeds all others in income producing ability is indeed an accomplishment. But how much does it exceed others? And is this greater value sufficient to offset increased costs, if any, and justify a farmer giving consideration to a change? Here is the crucial consideration. It seems, therefore, that for those experiments from which comparative results are sought for purposes of recommendation to those who will use the practice, dollars and cents measurements should be effected.

• **Fertilization** — The question of cotton fertilization is of tremendous importance. As we move steadily toward greater intensity in production, an economic analysis of varying levels of fertilizer use on cotton becomes essential. Such an analysis involves the determination of prices and cost rates to be applied. But of equal importance, it requires decisions in the design of the experiments that make it possible to apply dollars and cents measurements.

Recently, several agronomists and economists of the University's College Experiment Station at Athens sat together to plan a series of fertilizer response experiments. The agronomists were interested in the physical response of the crop to varying levels of fertilization. The economists' concern was the economic return on the investment in fertilizer at varying levels of application. Both wished, of course, to arrive at a sound basis for recommending to farmers the most profitable levels of fertilizer application on cotton for soils of certain types and fertility levels. The only difference in viewpoint came with the economists' desire to determine the return on investment in the fertilizer, using proven statistical methods. This necessitated some change in the design for the experiments, which was agreeable to both agronomists and economists. From these experiments will come physical response data and returns on investment for varying amounts of fertilizer on cotton. Sounder recommendations to farmers will result.

• **Price Differences** — The application of dollars and cents measurements to research experiments is not a simple calculation. For example, what price should be applied to an experiment determining yield advantages of one variety over another? Using corn as an illustration, the price could be $1.50 per bushel after storage for several months. It might be $1.10 per bushel from the field at harvest time; or 90 cents per bushel in the field before harvest. These price differences may be taken to represent 20 cents as the cost of harvesting corn and 40 cents as the cost of storing corn for several months. What price shall be used to determine the increase in value due to an improved variety? If the $1.50 is used, obviously cost of harvest and storage charges have been included along with the increased yield to indicate the greater value of one variety over another. In applying dollars and cents measurements, it is necessary to approximate as closely as possible the true value of benefits to be derived from the research findings. There are, therefore, important and difficult decisions to make.

So often we place little confidence in cost and income analysis placed upon research experiments. We say they are not practical because they are not done under practical farm conditions—and therefore farmers cannot apply them. I think we are in error on this conclusion. An analysis of cost and income in which the researcher, Extension worker and farmers have confidence is quite valuable and widely used. I feel that alert farmers desire this analysis in their consideration of what to do.

• **Economic Analysis Needed**—Obviously the methods or techniques of dollars and cents measurements of research experiments are of great importance. Splendid progress has been made in the area of economic analysis. These methods and experiences are available. They are being used widely. They deserve greater consideration. The key, in my opinion, for successful dollars and cents measurements of research experiments is in the consideration of this measurement at the time the plans for the experiment are laid. Some comparative experiments will never lend themselves to economic measurement. They were not planned for this. Others will because this factor was brought into the original planning of the experiment.

I believe we must give to farmers and other users of experimental findings more economic analyses of research dis-

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coveries. Such dollars and cents measurements will speed up the application of research findings and render them more effective in bringing about sounder systems of farming.

An Extension Service Program for Cotton

DR. C. B. RATCHFORD, Assistant Director, North Carolina Extension Service, Raleigh.

There are several points about present day cotton production which we need to have clearly in mind before discussing an Extension program for cotton.

The technology which has been flowing out of research has made cotton production immensely more complicated. Calibrating a spray to apply one or two gallons of weed killer per acre is a long way from hoeing. Four row planters and cultivators are a long way from a mule and half row cultivator.

A point of much greater inportance is the increased need for doing a good job across the board. For example, a test plot using all approved practices at one of our Experiment Stations failed to produce a bale per acre because of nematodes. With modern technology so expensive, it has become economic suicide for a farmer to fail on a single practice.

Another important point is that new technology has increased the alternatives for farmers. For example, before weed killers, there was no alternative to hoeing. Now a farmer can hoe, use weed killer, or both. The best alternative varies from farm to farm and perhaps from year to year on the same farm.

Finally, as a farmer uses more technology, the margin of error narrows. For example, when a farmer used no fertilizer, using any analysis and any reasonable amount was a gain. When a farmer is using near the correct number of pounds but is using the wrong analysis, the advice must be more precise. The chance of a general recommendation fitting any particular farmer exactly becomes less likely as the level of technology increases.

Thus it is clear that Extension must do more than merely serve as the mouthpiece for research. Extension workers must help farmers understand how the new technology fits into their own operations. Their problem is complicated in that the best use of a particular piece of technology varies from farm to farm depending upon the use of related practices, managerial ability, size of farm, capitol available, etc.

• **Individual Application** — The state Extension Services, working with the federal Extension Service and the farm organizations, have been critically examining the type of programs and methods required to carry out their mission. We found that at the same time the technological situation required that farmers use a package of practices and that the practices be tailored to individual farms, Extension was going in the opposite direction—namely, we were resorting to working with groups and to using mass media as a teaching tool. Extension had no alternative. The number of workers had not kept pace with either the amount of information to be taught or the number of farmers desiring assistance.

• **Lower Costs, Improved Quality** — A group of Extension directors and specialists met about three years ago to study the cotton situation. It was easy to agree that the major problem of cotton farmers was low net income. Many people had indicated that higher prices would help. An analysis of the situation made it clear, however, that higher prices would make cotton less competitive and result in a declining market. In fact there was considerable evidence that prices needed to be lowered if cotton was to maintain its place in the economy. The alternative was to help farmers substantially lower production costs and improve quality. This would increase profits and expand the market, particularly if costs could be reduced to the extent that a lower price was feasible. It was felt that research and its application was the way to accomplish the goals of higher net income and an expanding market.

I want to discuss two activities designed for Extension to help farmers accomplish these goals.

• **Cotton Demonstrations** — The directors and specialists developed what are being called complete cotton demonstrations. The over-all objective of the complete cotton demonstrations was to demonstrate to producers and others that through using a combination of good practices in production and marketing it was possible to incerase yields, prevent damage to fiber quality, lower per unit production costs, and increase prof-

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its. The County Agents throughout the Cotton Belt were asked to select farmers who were capable and willing to carry out, with the advice of the County Agent, all of the practices which should add to net income from cotton on his farm.

In 1955, there were 3,552 of the complete cotton demonstrations conducted in the 10 Southeastern States. A study of these demonstrations revealed that average yield per acre was 613 pounds while the yield for the states represented was 375 pounds; that, on a representative sampling of the farms, the average cost per pound was 20 cents as compared to a Beltwide production cost of 27 cents (National Cotton Council study); and that net income per acre was increased by about $122.

These demonstrations have certainly helped the participating farmers and their neighbors. They have shown that good practices, where used in proper combination, have a supporting effect on each other that results in a greater total benefit than the sum of these practices used separately.

• **Farm and Home Development** — Now let's turn our attention to the second of the new activities. It is called farm and home development in most states. It is an Extension tool which includes two elements which Extension was seldom able to use in the past.

First, it involves a **personalized approach** on the part of an Extension agent with the family. It involves an Extension agent working with a single individual or family with at least part of the individual contacts being made on the farm.

Secondly, the **unit approach** is used. The unit is the farm and the family and its resources. The agent advises not on a single practice, but on every phase of the farming operation.

The objective of farm and home development with regard to farm people is to help families increase incomes and level of living through (1) Teaching and encouraging the adoption of new technology, (2) optimum allocation of resources, and (3) sound business methods. The objective of farm and home development with regard to the Extension Service is to strengthen, but more important to redirect, the total Extension effort to serve agriculture and the nation.

Farm and home development has certain characterists which make it possible to speed up the average rate of adoption of technology and improvement in resource allocation:

(1) Through individual assistance, families are able to diagnose their ills.

(2) The personalized approach makes it posisble to tailor information to the individual case. The average farmer needs help in determining which information applies to his farm. He also needs help in adjusting the information to his farm.

(3) Through the personalized unit approach the family is given help in working out the best solution to its problems—not just a solution that improves the situation. The very core of farm and home development is exploring all possible alternatives; helping the family properly evaluate the alternatives, and encouraging the family to select the one that is best for it.

(4) The effect of a particular piece of technology is related to the entire unit. For example, if a farmer is considering increasing cotton yields through adopting a sound rotation, the agent helps the farmer trace possible effects of this throughout the farm business.

(5) Technology is appraised in economic terms. Farmers think in economic terms when considering new technology.

(6) Help is given in determining capital and skills needed to make a particular change. Assistance is given in developing a step-by-step procedure for making the change. Many farmers do not make changes because they are not sure of the total requirements and procedures.

(7) It is possible through farm and home development to work with families who are not now using the Extension Service. We have had only one case of a family not responding, to at least some degree, to the personalized unit approach. Many of the so-called "backward" families are making the greatest progress.

In North Carolina, we have used increased federal money, plus a considerable amount of county funds, to add from two to five workers in a number of counties to spend full time doing farm and home development. We added more than one worker because we wanted the results to stand out. Prior experience has led us to believe that each agent could build up to a workload of 200 families by the end of five years. Some are approaching this by the end of two years.

Although the work is still young, we are getting encouraging results. In Cleveland County, one of our big cotton counties, farm and home development was started late in the fall of 1954. By the end of 18 months, the agents were working with 134 families. These families had increased gross income, during a period of falling prics, an average of $2,776 per farm. This was done through adding new enterprises and by doing a better job with existing enterprises, including cotton. There are individual examples of farms which have increased net income fivefold in a two-year period.

In Nash County, records are available on cotton production in 1957 from 12 farms participating in farm and home department. These farmers averaged 800 pounds per acre or over twice the state average.

Of course, Extension is not going entirely to the farm and home development approach. While we hope to do more of it, we must still make extensive use of the mass media, which are excellent for disseminating some information. Where they are suited, they should be used. We are striving for a balanced total program that will give farmers the type of educational service they want and deserve.

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• Pesticide Sales Set Record in 1956

PESTICIDE CHEMICAL sales in 1956 reached an estimated $250 million at the basic producers' level. This is 25 percent higher than the 1955 producers' sales of $200 million, according to the National Agricultural Chemicals Association.

Markets for pesticides expanded in four different areas during the year: The farm market—where more farmers are using pest control chemicals to reduce per unit costs of production; the home garden market—the rapidly increasing number of suburbanites are using these products to grow healthy plants and weed free lawns; the world market—increased use of insecticides in public health programs to wipe out certain diseases through the elimination of disease-carrying insects; the national market — increased use of chemicals to control weeds, brush, insects and turf diseases along roadsides of national highways.

Oil Purchaser Named

Italian Federation of Farmer Cooperatives, 477 Madison Ave., New York, has been named authorized importer for the $20,547,000 worth of cottonseed and soybean oil being bought by Italy.

Atlantic Steel Promotes Lynch, Johnson, Stone

Atlantic Steel Co. directors have named Robert S. Lynch chairman and chief executive officer, and Howard B. Johnson, president. Charles F. Stone, board chairman since 1947, was named chairman of the executive committee. No other changes were made in officer personnel.

Directors declared a dividend of 32 cents per share on common stock.

Lynch, a native of Vandergrift, Penn., is an alumnus of Ohio State. He has been connected in various capacities with American Sheet and Tinplate Co., United Alloy Corp., and Republic Steel Corp. He joined Atlantic Steel in 1944 as general superintendent. In 1946 he was made vice-president, and in January, 1947, was elected president. Among his other activities, he is chairman of the board of Continental Gin Co., Birmingham, Ala. He also is a director of the American Iron and Steel Institute, the Atlanta Chapter of the American Red Cross, and was recently named to the national board of directors of the Conference of Christians and Jews. He is a member of the advisory council for Science and Engineering, University of Notre Dame, and has served as state and city chairman of numerous civic organizations.

Johnson was born in Tallapoosa, Ga., and is a graduate of Georgia Institute of Technology. He joined Atlantic Steel in 1933 as an accountant. He later became order department manager and was named assistant secretary in 1945, and vice-president, finance and accounting, the following year. In 1949 he became vice-president in charge of sales and finance. He was elected to the board of directors in 1950 and in September, 1956, was named executive vice-president.

Johnson is active in many business and civic organizations, among which are the Atlanta Rotary Club and the American Iron and Steel Institute. He is a director of the Atlanta Chamber of Commerce and of the Atlanta Better Business Bureau. He is trustee of the Georgia Tech Alumni Foundation, of the Tech-Georgia Development Program and of the George M. Sparks Scholarship Foundation.

Stone, although born in Chattanooga, Tenn., has been a lifelong resident of Atlanta. A Georgia Tech graduate, he joined Atlantic Steel in 1910 in a sales capacity. He became general manager of sales in 1914, and in 1921 was named vice-president. He was elected a director and president of the company in 1932 and was named chairman of the board in 1947. He is also a director of the Trust Company of Georgia and of the Continental Gin Co.

S. D. Dunn, Retired Oil Mill Manager, Dies

S. D. Dunn, 94, died recently at Winnsboro, S.C. He had completed 55 years of oil milling and was manager of Southern Cotton Oil Co. at Winnsboro when he retired about 15 years ago. He was the oldest graduate of the University of South Carolina at the time of his death, and had taught school before becoming associated with the oil mill industry. He is survived by a number of nieces.

• Arkansas Analyzes Cost of Spraying

HIGH-CLEARANCE SPRAYERS may be more economical than hiring planes to dust cotton, where more than 1,000 machine-acres of cotton will be covered during the year, Arkansas research indicates.

Results of work with 13 high-clearance spray machines in 1955 in Jefferson, Lincoln and Lonoke counties was reported recently by James M. White of Arkansas Experiment Station.

A cost analysis indicated that a farmer with 250 acres of cotton who makes as many as four insecticide applications annually, will have an estimated annual cost of about $420 when the spray machine is used. He would pay $480 if custom applicators were employed.

A farmer with 500 acres, poisoning four times, would have a cost of $540 per season with the spray equipment, compared with $960 for custom work by plane; while 750 acres could be poisoned four times a season with the high-clearance machine for $660 against $1,440 by plane.

■ **ELMER HUDSPETH, USDA engineer at the Lubbock, Texas, Experiment Substation since 1950, transfers Jan. 1 to Amarillo Experiment Station.**

Friends Present Ginner With Dinner, Car

Customers of the Broadview Gin, located in Lubbock County, joined with the employers of Paschall Smart, ginner at the Broadview Gin, to make his 1956 Christmas one to remember.

Smart has been an employee of the gin for the last 20 years, and has ginned cotton for many of the farmers living west of Lubbock.

Ninety-three friends attended a dinner which was held for Smart and his wife. Bill Wright, owner-manager of the gin, was master of ceremonies. He presented Smart with the keys to a new car.

Plant Food Use About Same

William S. Ritnour, National Plant Food Institute, estimates that U.S. fertilizer consumption was 19,980,264 tons during the year ended last June 30. While tonnage was one million tons less than in 1954-55, the trend toward higher nutrient content of fertilizers may have made plant food use about the same as in the previous year.

■ **ROY F. SAUNDERS, long identified with cotton breeding in Texas, now is doing similar work in Java.**

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CALENDAR

Conventions - Meetings - Events

12	13	14	15	16	17	18

• Jan. 14-16 — Fourth Conference on Cottonseed Processing and Nutritive Value of Cottonseed Meal. Southern Utilization Research Branch, USDA, New Orleans. Sponsored by USDA and National Cottonseed Products Association. For information, write Dr. A. M. Altschul, USDA, 1100 Robert E. Lee Boulevard, New Orleans.

• Jan 17-18 — Alabama-Florida Cotton Ginners' Association meeting. Dinkler-Tutwiler Hotel, Birmingham, Ala. For information, write Tom Murray, executive vice-president, Room 714 Henry Grady Bldg., Atlanta 3.

• Jan. 21-22 — Texas Cotton Ginners' Association Directors' and Allied Industry Meeting. Casa de Palmas, McAllen, Texas. Edward H. Bush, 3724 Race Street, Dallas, executive vice-president.

• Jan. 22—Farmers' Union Cooperative Ginners' Association of Oklahoma. American Legion Building, Hobart, Okla. For information, write Lucile Millwee, secretary, Box 631, Carnegie, Okla.

• Jan. 23-25 — Southern Weed Conference. Bon Aire Hotel, Augusta, Ga., Dr. W. B. Albert, South Carolina Experiment Station, Clemson, president.

• Jan. 28-29 — National Cotton Council of America annual meeting. Jefferson Hotel, St. Louis. For information, write Wm. Rhea Blake, executive vice-president, P. O. Box 9905, Memphis, Tenn.

• Jan. 31-Feb. 1—Carolinas Ginners' Association annual convention. Clemson College, Clemson, S.C. Clyde R. Allen, executive secretary, P. O. Box 512, Bennettsville, S.C.

• Feb. 4-5—Texas Cooperative Ginners' Association, Houston Bank for Cooperatives and Texas Federation of Cooperatives joint meeting. Rice Hotel, Houston. For information, write B. E. Schroeder, 307 Nash Building, Austin.

• Feb. 4-5—Cottonseed Processing Research Clinic. Southern Regional Research Laboratory, New Orleans. Sponsored by Valley Oilseed Processors' Association and USDA. C. E. Garner, 1024 Exchange Building, Memphis, Association secretary.

• Feb 12-13 — Alabama-Florida Cotton Ginners' Association and Georgia Cotton Ginners' Association joint meeting. Biltmore Hotel, Atlanta. Concurrent with Southeastern Gin Suppliers' Exhibit. Tom Murray, executive officer, Room 714, Henry Grady Bldg., Atlanta 3.

• Feb. 12-13 — Southeastern Gin Suppliers' Exhibit. Biltmore Hotel, Atlanta. Sponsored by Southeastern Ginners' Council, composed of ginners of Alabama, Georgia and Florida. For information and space, write Tom Murray, 714 Henry Grady Building, Atlanta 3.

• Feb. 27-March 1 — Cotton Research Clinic. General Oglethorpe Hotel, Savannah, Ga. For information, write National Cotton Council, P. O. Box 9905, Memphis.

• Feb. 28-Mar. 1 — Oklahoma Cotton Ginners' Association annual convention. Skirvin Hotel, Oklahoma City. Edgar L. McVicker, 1004 Cravens Building, Oklahoma City, secretary-treasurer.

• March 2 — Tri-States Oil Mill Superintendents Association regional meeting. Greenville, Miss. B. C. Lundy, chairman; Woodson Campbell and Martin Letchworth, co-chairmen.

• March 4-5 — Western Cotton Production Conference. Hotel Westward Ho, Phoenix, Ariz. Sponsored by Southwest Five-State Cotton Growers' Association and National Cotton Council.

• March 11-13 — Midsouth Gin Supply Exhibit. Midsouth Fairgrounds, Memphis. For information, write W. Kemper Bruton, P. O. Box 345, Blytheville, Ark. Arkansas-Missouri, Louisiana-Mississippi and Tennessee ginners' associations sponsor the exhibit and will hold their annual convention concurrently.

• March 11-13—Arkansas-Missouri Cotton Ginners' Association annual convention. Memphis. W. Kemper Bruton, P. O. Box 345, Blytheville, Ark., executive vice-president. Concurrent with Midsouth Gin Supply Exhibit.

• March 11-13 — Louisiana-Mississippi Cotton Ginners' Association annual convention. Memphis. Gordon W. Marks, P. O. Box 1757, Jackson, Miss., secretary. Concurrent with Midsouth Gin Supply Exhibit.

• March 11-13 — Tennessee Cotton Ginners' Association annual convention. Memphis. W. T. Pigott, Milan, Tenn., secretary-treasurer. Concurrent with Midsouth Gin Supply Exhibit.

• March 25-26—Valley Oilseed Processors' Association annual meeting. Buena Vista Hotel, Biloxi, Miss. C. E. Garner, 1024 Exchange Building, Memphis, secretary.

• April 1-3 — Texas Cotton Ginners' Association Convention, State Fair of Texas grounds, Dallas. Ed H. Bush, executive vice-president, 3724 Race Street, Dallas. For information regarding exhibit space, write R. Haughton, president, Gin Machinery & Supply Association, P. O. Box 7985, Dallas 26.

• Apr. 30-May 1-2 — Spring meeting of American Oil Chemists' Society. Roosevelt Hotel, New Orleans. For information, write American Oil Chemists' Society, 35 East Wacker Drive, Chicago.

• May 2-3 — National Cotton Compress and Cotton Warehouse Association annual convention. Roosevelt Hotel, New Orleans. John H. Todd, 1085 Shrine Building, Memphis, executive vice-president.

• May 8-10 — Oil Mill Operators' Short Course. Texas A. & M. College, College Station. Sponsored by Texas Cottonseed Crushers' Association and International Oil Mill Superintendents' Association.

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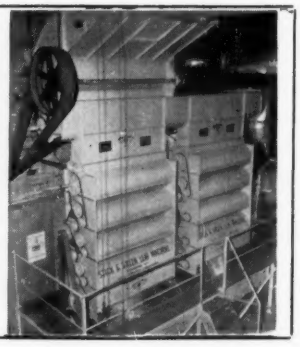

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• May 14-15 — Oklahoma Cottonseed Crushers' Association annual convention. Western Hills Lodge, Sequoyah State Park, Wagoner, Okla. Edgar L. McVicker, 1004 Cravens Building, Oklahoma City, secretary-treasurer.

• May 20-21—National Cottonseed Products Association annual convention. Shoreham Hotel, Washington, D.C. John F. Moloney, 19 South Cleveland Street, Memphis, secretary-treasurer.

• June 3-4—Alabama-Florida Cottonseed Products Association and the Georgia Cottonseed Crushers' Association joint convention. Edgewater Gulf Hotel, Edgewater Park, Miss. For information, write C. M. Scales, 322 Professional Center, Montgomery 4, executive secretary, Alabama-Florida Association; J. E. Moses, 318 Grand Theatre Bldg., Atlanta, secretary of Georgia Association.

• June 5-6 — Tri-States Oil Mill Superintendents Association annual convention. Peabody Hotel, Memphis. Roy Castillow, 20 Lenon Drive, Little Rock, Ark., secretary.

• June 9-11 — Texas Cottonseed Crushers' Association annual convention. St. Anthony Hotel, San Antonio. Jack Whetstone, 624 Wilson Building, Dallas, secretary-treasurer.

• June 16-18 — South Carolina Cotton Seed Crushers' Association and North Carolina Cottonseed Crushers' Association joint convention. Fort Sumter Hotel, Charleston. For information, write Mrs. M. U. Hogue, secretary-treasurer, North Carolina Association, 612 Lawyers Bldg., Raleigh; Mrs. Durrett L. Williams, secretary-treasurer, South Carolina Association, 609 Palmetto Bldg., Columbia.

• June 16-19—International Oil Mill Superintendents Association. Hilton Hotel, El Paso. For information, write H. E. Wilson, secretary-treasurer, P. O. Box 1180, Wharton, Texas.

• June 19-20-21—Southwestern Peanut Shellers' Association annual convention. Menger Hotel, San Antonio, Texas. For information, write John Haskins, Durant Peanut Co., Durant, Okla., secretary-treasurer.

• Sept. 30-Oct. 1-2 — Fall meeting of American Oil Chemists' Society. Cincinnati. For information, write American Oil Chemists' Society, 35 East Wacker Drive, Chicago.

•Oct. 2-3-4 — Beltwide Mechanization Conference, Shreveport, La. For information, write National Cotton Council, P. O. Box 9905, Memphis.

• Dec. 12-13 — Beltwide Cotton Production Conference. Peabody Hotel, Memphis. For information, write National Cotton Council, P. O. Box 9905, Memphis.

Agricultural Workers' Program Completed

The program for the annual meeting of Texas Agricultural Workers' Association, Jan. 10-11, has been announced by Fred M. Shaw, Dallas, president. The meeting of professional agricultural workers will be held at Memorial Student Center, Texas A.&M. College, College Station.

"Agriculture's New Look" is the theme for the meeting. Assistant Secretary of Agriculture Earl Butz will address the annual banquet on Jan. 10.

Members have been invited to attend the dedication of the new Foundation Seed Stocks Building at Texas A.&M. College on Jan. 10.

Irrigation Improvement Pays Off Next Year

Water is valuable at any time, but the coming season of short supply will make it even more precious. Take measures now to avoid waste, advises Allan D. Halderman, Arizona Extension Service.

Most losses occur from seepage in unlined ditches, from holes in lined ditches and from excessive tailwater and deep seepage at the upper end of the field.

Flood waters also present a serious hazard to irrigation systems. Diversions and dikes, properly located and installed, will provide inexpensive protection for ditches and linings.

High Plains Farmers Add To Water Pipelines

Irrigation farmers in the High Plains area of Texas added 710 miles of underground concrete pipe to their irrigation facilities during 1956. This makes a total of 2,532 miles of pipe now in use, says George L. Black, Jr., associate irrigation agent for Texas Extension Service.

The cost of installing an underground irrigation system is high, says Black, but since its lasting qualities are very good, the savings made in water, labor and better water distribution make it a paying proposition.

Fire Destroys Baled Cotton

Fire raged through an open gin yard of the Stanfield Y. D. Gin, Stanfield, Ariz., Dec. 9, 1956. Approximately 783 bales of cotton out of 912 bales were lost in the fire.

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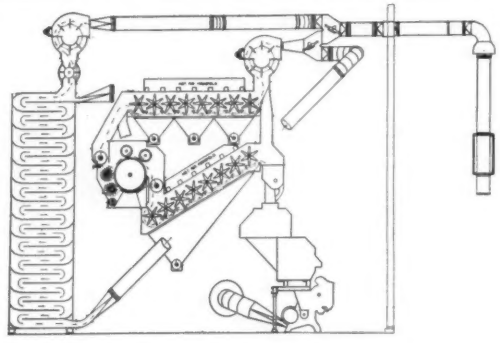

Note the hot air on the cleaners is blown through the cotton by a series of nozzles (similar to the air blast nozzles on a gin stand), forcing the dirt, leaf trash and stems through the screen. Cleaners made in any number of cylinders to meet local conditions.

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The STACY COMPANY, Inc.

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Closed view of our eight cylinder cleaner and drier.

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Robert Burgher, Dallas, Texas Mason Jackson Co., Shreveport, La.

Foreign agent: M. Neumann & Son, Inc., 90 West Street, New York 6, N. Y.

laugh it off

The efficiency expert died and they were giving him a fancy funeral.

Six pallbearers were carrying the casket out of the church when suddenly the lid popped open and the efficiency expert sat bolt upright and shouted, "If you'd put this thing on wheels, you could lay off four men."

• • •

Teacher to history student: "So you want to know why you didn't pass your test? Well, your answer to the question 'Why did the pioneers go into the wilderness' was interesting from the standpoint of sanitation and romance, but it was still incorrect!"

• • •

The dying man beckoned to his wife. "Sarah," he whispered, "be sure to put David in charge of the store when I'm gone."

"David? Why not Joey? He's a smart boy."

The man nodded weakly. "Okay, but give Harry the station wagon."

"But Benny needs it for his family!"

"All right—give it to Benny. But I think the house in the country should go to Shirley."

"Papa, you know Shirley hates the country. Give it to Rosalie."

The old man finally lost his patience. "Mama," he groaned, "Who's dying—you or me?"

• • •

In the sales manager's office, a young farmer was applying for a job as salesman. After filling out the items on the application form he came to a space for "remarks." He chewed his pencil thoughtfully for a few minutes then spelled out:

"Mighty purty day."

• • •

The face that over cocktails seems so sweet; may be less alluring over shredded wheat.

• • •

Two camels trudged along side by side in a caravan crossing the burning desert. Finally one looked around furtively and said: "I don't care what anybody says, I'm thirsty."

• • •

New calf to new colt: "We've been in the milk business for generations. What business are your folks in?"

• • •

She fell with a light sigh into his arms. Her head tilted backward and their lips met. She turned her head slowly then spoke softly, "You understand, don't you, that I've never done a thing like this before?"

"My," said the salesman, "You certainly inherited a lot of talent."

• • •

She: "Goodness, George, this isn't our baby! It's the wrong carriage!"

George: "Shhh, quiet — this one has tires!"

• • •

The salesmanager, a visitor at a golf club, paid his greens fee and fixed up a match. At the first tee he made a wild swing and completely missed the ball.

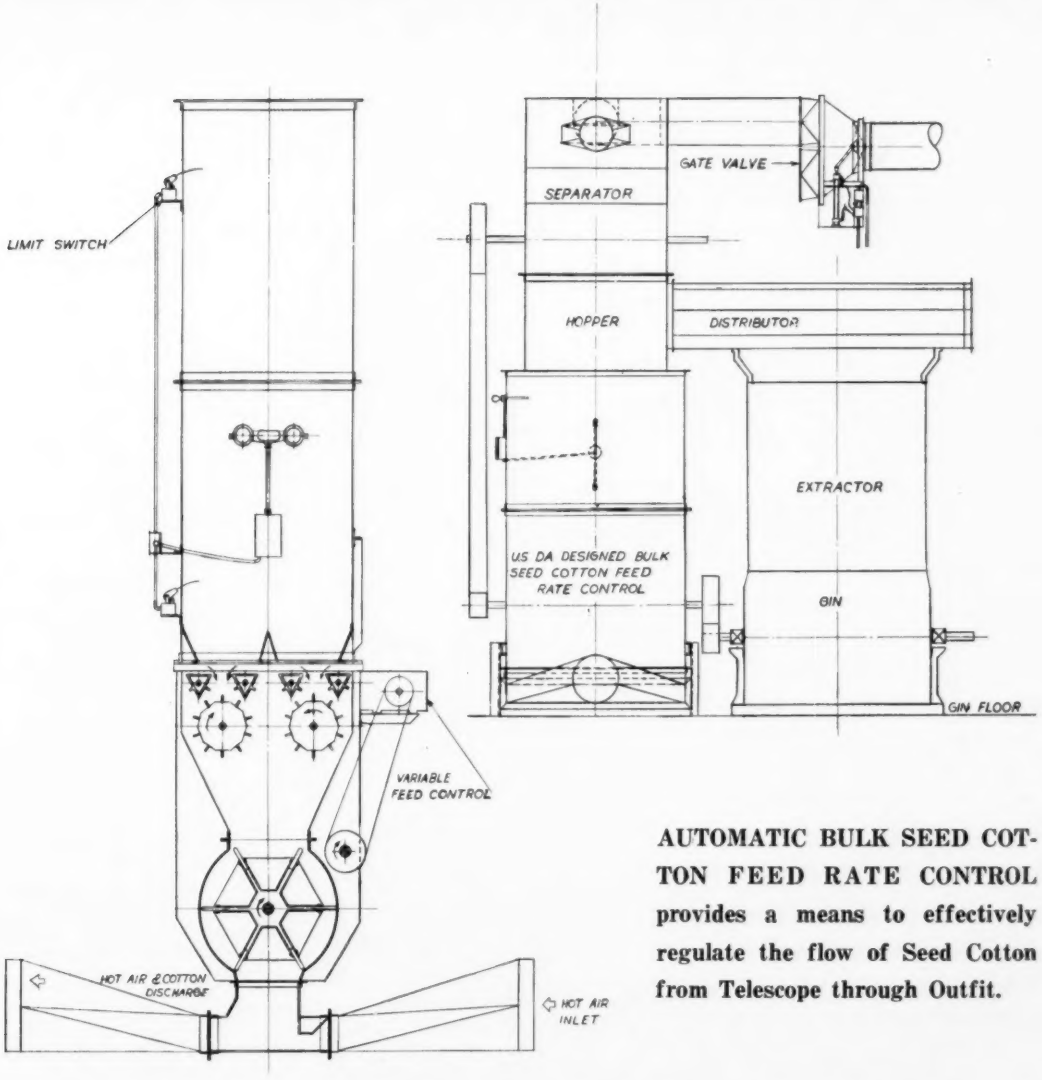
"By golly," he said, "it's a good thing I found out right at the start. This course is at least two inches lower than the one I usually play on."

• • •

Career Girl: One who is more interested in plots and plans than pots and pans.

GULLETT

ESTABLISHED 1849



AUTOMATIC BULK SEED COTTON FEED RATE CONTROL provides a means to effectively regulate the flow of Seed Cotton from Telescope through Outfit.

A Regulated Controlled Rate of Feed insures a uniform flow of seed cotton to Driers, Cleaners and Burr Machines.

Cleaning-Drying equipment operates more efficiently and thoroughly when supplied with a uniform flow of cotton.

Installation of Control Unit can be made to replace over-flow pen and eliminate extra handling of overflow cotton.

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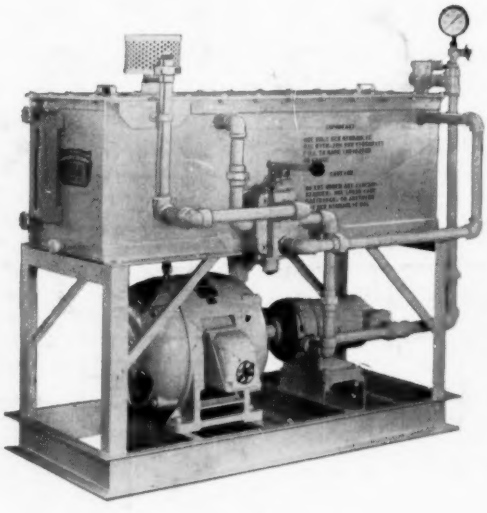

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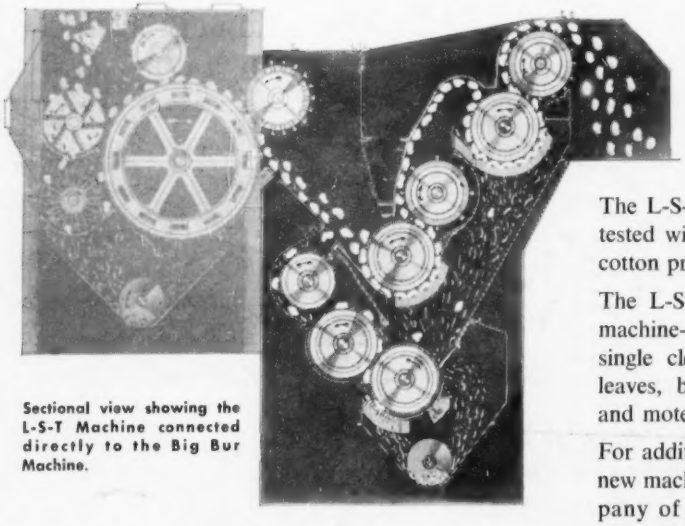
FOR LEAF ★ STICK ★ TRASH ★ REMOVAL



Sectional view showing the L-S-T Machine connected directly to the Big Bur Machine.

Top Ranking In CLEANING Effectiveness

The L-S-T machine has been thoroughly field-tested with excellent results regardless of type cotton processed.

The L-S-T machine will raise the quality of machine-picked cotton more than any other single cleaning operation by removing green leaves, bur particles, sticks, grass, pin trash and motes.

For additional information regarding this great new machine, please contact The Murray Company of Texas, Inc., Dallas — Atlanta — Memphis — Fresno.

Proven Performance
And Advanced Design

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